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Vol. XXIV, pp. vii–xii January 23, 1912

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

PROCEEDINGS.

The Society meets in the Assembly Hall of the Cosmos Club on alternate Saturdays at 8 P. M.

January 7, 1911—477th Meeting.

President David White in the chair and 51 persons present.

The president appointed the following committees for the year 1911:

On Communications: Vernon Bailey, Albert Mann and Paul Bartsch.

On Publications: W. P. Hay, N. Hollister and J. W. Gidley.

Barton W. Evermann reported observations of the brown rat's catching flies, at Kokomo, Indiana.

C. D. Marsh made comments on a recent report by Aars on biological investigations in Lake Tanjanyika, Africa.

The following communications were presented:

"Notes on the Aspens": I. Tidestrom.

"Some Nesting Habits of the Water Ousel and the Cuckoos": N. Dearborn.

"A Recently Imported Enemy of Alfalfa": F. M. Webster.

January 21, 1911—478th Meeting.

The president in the chair and 175 persons present.

The following communication was presented:

"Collecting Big Game with Roosevelt in Africa": Edmund Heller.

February 4, 1911—479th Meeting.

The president in the chair and 64 persons present.

The following communications were presented:

"A New Translation of Aristotle's History of Animals": Theodore Gill.

"The Insect Fauna of Telegraph Poles": T. E. Snyder.

"The Domestication of Wild Animals": D. E. Lantz.

February 18, 1911—480th Meeting.

The president in the chair and 45 persons present.

General Wilcox reported having heard a flock of migrating geese on February 14, and also noted that trailing arbutus may be transplanted successfully if taken up with a mass of the soil without loosening the roots.

The following communications were presented:

"The Mechanics of Cell Activity": Carl L. Alsberg.

"Some Cactus Insects, with special reference to Cochineal": W. D. Hunter.

March 4, 1911—481st Meeting.

Vice-President W. P. Hay in the chair and 95 persons present.

The following communications were presented:

"The Desert Country of Northern Lower California": Dr. W. J. Mixter.

"Afoot across the British Columbia Rockies": George Mixter.

E. A. Preble exhibited a series of skins of mammals and birds secured by George Mixter and himself in the trip referred to in the second communication.

March 18, 1911—482d Meeting.

Vice-President W. P. Hay in the chair and 53 persons present.

C. D. Marsh reviewed briefly a recent paper on the Geographic Distribution of Diatoms, by Hollinger, published in the Jena Zoologische Jahrbüch.

The following communications were presented:

"Raising Trailing Arbutus from the Seed": F. V. Coville.

Notes on Javan Natural History and the Salt Makers of Tjihara, Java": William Palmer.

April 1, 1911—483d Meeting

President White in the chair and 93 persons present.

F. V. Coville exhibited a pot of flowering trailing arbutus grown from the seed.

The following communications were presented:

"A Day in the Galapagos Islands": W. E. Safford.

"The Keys, Corals and Coral Reefs of Florida": T. Wayland Vaughan.

April 15, 1911—484th Meeting.

The president in the chair and 57 persons present.

O. P. Hay exhibited a fossil skull of a large fresh water snapping turtle from Texas.

Chas. Wardell Stiles reported progress of the International Committee on Zoological Nomenclature.

David White exhibited specimens of bituminous coal, showing fragments of carboniferous plants.

The following communication was presented:

"The House Fly and Typhoid Fever": L. O. Howard.

The paper was discussed by Dr. C. Gordon Hewitt, Dominion Entomologist, of Ottawa, Canada, and several visiting physicians of the city.

May 13, 1911—485th Meeting.

The president in the chair and 46 persons present.

A. S. Hitchcock gave a brief review of a recent number of the North American Flora and of a paper by Nieuwland on the type of *Panicum*.

The regular programme consisted of Biological Notes from the recent Albatross Expedition to Lower California. Chas. H. Townsend gave a general account of the trip. J. N. Rose discussed the desert vegetation, and Paul Bartsch the fauna of the trip.

October 21, 1911—486th Meeting.

President White in the chair and 54 persons present.

The following communication was presented:

"The Ice Age and its Extinct Animals": O. P. Hay.

November 4, 1911—487th Meeting.

The president in the chair and 74 persons present.

W. P. Hay exhibited lantern slides of living Amphioxus and of the blue crab, showing the egg masses of the latter.

The program consisted of talks on Recent Explorations in Panama. The results of the recent exploring expedition under the auspices of the National Museum were presented by S. E. Meek, E. A. Schwarz, E. A. Goldman and August Busck. Numerous illustrations were used.

November 18, 1911—488th Meeting.

The president in the chair and 56 persons present.

The following communications were presented:

"A Study of Distribution based upon the family Pyramidellidae": Paul Bartsch.

"Peculiar Migration of the Evening Grosbeak": W. W. Cooke.

December 2, 1911—489th Meeting.

The president in the chair and 49 persons present.

General Wilcox noted having found numerous particles of white quartz in the stomachs of the blue grouse.

Barton W. Evermann reported the safe arrival in the United States of ten young fur seals from the Pribilof Islands.

L. O. Howard reported that R. S. Woglum of the Bureau of Entomology had returned from Asia, bringing six cases of living parasites of the white fly, so destructive to citrus fruits in Florida.

The following communications were presented:

"The Hooting of the Blue Grouse": E. A. Preble.

"Notes on the Fishes of the District of Columbia": A. C. Weed.

"On another supposed Fruit-bearing Fern-like plant from the American Permian": David White.

December 16, 1911—490th Meeting.

THIRTY-SECOND ANNUAL MEETING.

President White in the chair and 32 persons present.

Reports of the secretaries, the treasurer, and chairmen of standing committees were received and placed on file.

The election of officers for the year 1912 resulted as follows:

President: E. W. Nelson.

Vice-Presidents: W. P. Hay, J. N. Rose, A. D. Hopkins, Paul Bartsch.

Recording Secretary: D. E. Lantz.

Corresponding Secretary: N. Hollister.

Treasurer: J. W. Gidley.

Members of the Council: Vernon Bailey, A. K. Fisher, A. B. Baker, Hugh M. Smith, William Palmer.

Appointment of standing committees was deferred.

D. E. Lantz,
Recording Secretary.

Vol. XXIV, pp. 1–2 January 28, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW MUSK-DEER FROM KOREA.

BY N. HOLLISTER.

[By permission of the Secretary of the Smithsonian Institution.]

During the winter of 1902-3, Dr. William Lord Smith, of Boston, hunted in southwestern peninsular Korea, and later, with other spoils of the trip, presented to the United States National Museum the skin of an undescribed musk-deer. Doctor Smith writes of his trip:* "I started from Mok-po (lat. 35°) and went down the coast, partly by boat and partly on foot, to the end of the peninsula. The specimens in question were collected during November and December, 1902, and January, 1903. I was never far from the western coast line and was really tiger shooting, bagging two tigers myself, my hunter getting one."

Korea appears not to have been included in the range of the musk-deer as given in recent works, though the animal was recorded from there as far back as 1867 by Père David.† Had Doctor Smith undertaken his trip in summer, he would, doubtless, have missed the capture of this handsome new species.

Moschus parvipes sp. nov.

Type from mountains near Mok-po, South Tscholla Province, Korea. Cat. No. 143,184 United States National Museum. Skin only, collected winter of 1902-3, by Dr. William Lord Smith.

General characters.—Smaller than *Moschus moschiferus* or any of the described related forms; legs slender and feet small, with much smaller main and lateral hoofs. Color strikingly rich and dark, with sharp markings; hair of winter coat much softer and shorter than in *M. moschiferus*, only about 35 mm. long on shoulders.

* Letter to Austin H. Clark, January 27, 1910.

† Bull. nouv. arch. mus. d'hist. nat. Paris, III, p. 29, 1867.

Color of type.—Top of head, from nose to back of nape, dark blackish brown; cheeks, spot between eye and ear, and sides of muzzle, mixed with yellowish white; ears outside mixed black and white, inside pure white, tips rimmed with black; a white streak from eye to throat; throat mixed black and white. A snow-white streak, sharply defined, extends from ear, joins the white of throat on side of neck, and extends backward to shoulders. Back, from nape to rump, pale russet, much mixed with dark blackish brown, and with many indistinct creamy white spots, which become especially numerous and more distinct on posterior half of body and hips. Sides dark blackish brown; underparts mixed brown and white. Shoulders and forelegs outside, dark brown; inside of legs with a streak of mixed brown and white the entire length to lateral hoofs. Hips and hind legs dark brown with stripe of mixed black and white down front of leg to near hoofs. Tail dark blackish brown above; mixed with white beneath; an indistinct whitish area below tail.

Measurements of dry skin.—Length from nose to root of tail, 875 mm.; hind foot, to end of hoofs, 255; fore foot, to end of hoofs, 170; ear, 77; length of front surface of forward hoofs, 25; of hind hoofs, 27; length of hind lateral hoofs, 20.5.

Remarks.—Unfortunately, the skull of this specimen was destroyed for food by Doctor Smith's native assistants before it could be saved, and the cranial characters of the species are therefore unknown.

Vol. XXIV, pp. 3–6 January 28, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF TWO NEW RACCOONS.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

The United States National Museum contains specimens of two species of *Procyon* which appear not to have been hitherto described.

Procyon pumilus sp. nov.

Type.—Young adult (rostral sutures open, those of braincase closed; teeth slightly but evidently worn), skin and skull, No. 171,983, U. S. National Museum. Collected at Ancon, Panama, by Dr. Allan H. Jennings.

Diagnosis.—Resembling *Procyon pygmæus* Merriam of Cozumel Island, Yucatan, but size somewhat less diminutive, color less yellowish, teeth relatively less reduced, and nasal bones not distinctly widened posteriorly.

Color.—Upper parts and sides a clear grizzled gray without evident yellowish tinge, the underfur drab, darkening appreciably at ends of hairs, the longer hairs with black tip and a subterminal annulation of buffy white; the whitish element in excess on neck, shoulders and sides, the black along middle of back, especially across lumbar region, where it tends to produce a median line; crown like sides but more finely grizzled and with light element a clearer white; face markings normal, but black band broader than in *P. pygmæus* and light area above eyes correspondingly reduced; tail dull buff in strong contrast with gray body, the seven black rings well defined, about half as wide as the light interspaces; underparts drab mixed with the whitish of the longer hairs, but without black except for the broad dark interramial band; fore legs like sides but strongly tinged with drab; hind legs similar but becoming blackish on inner side above heel.

Skull.—The skull differs from that of *Procyon pygmæus* in its slightly less reduced size, in the form of the audital bullæ and apparently also in the outline of the nasal bones. Audital bullæ with meatal region distinctly more tubular than in either *P. pygmæus* or *P. hernandezii*, the difference apparently due to reduction in the area of inflated portion. Nasal bones

scarcely widened posteriorly and showing no tendency toward the broadly rounded form of the terminal region characteristic of *P. pygmæus*. General form of skull decidedly wider than in *P. hernandezii*, a peculiarity equally noticeable in the relatively greater zygomatic breadth and in the more inflated anterior portion of braincase.

Teeth.—Though showing no special peculiarities of form the teeth are readily distinguishable from those of *Procyon hernandezii* by their much smaller size, and from those *P. pygmæus* by their less reduced condition, this character especially noticeable in pm^4.

Measurements.—External measurements of type (from skin): head and body, 430; tail, 235; hind foot, 97 (93). Skull of type and of a second specimen of the same age, the measurements of the latter in parenthesis: condylobasal length, 101 (96.6); zygomatic breadth, 63.6 (67.0); interorbital constriction, 20.4 (19.0); breadth of braincase, 46.6 (43.0); nasal (median), 25.2 (27.6); mandible, 75 (72.4). For dental measurements see table.

Measurements of the skulls of *P. pygmæus*, the type, a young male with sutures on upper part of braincase open (basal suture closed), and a female of same age as type of *pumilus:* condylobasal length, 92.8 (91.8); zygomatic breadth, 58.6 (60.2); interorbital constriction, 19.6 (19.8); breadth of braincase, 43.0 (43.2); nasal (median), 23.2 (22.2); mandible, 69.2 (66.8).

Measurements of a skull of *P. hernandezii* from Colima, Mexico, same age as type of *P. pumilus:* condylobasal length, 115.4; zygomatic breadth, 76.2; interorbital constriction, 24.2; breadth of braincase, 50.4; nasal (median), 31.2; mandible, 84.4.

Specimens examined.—The type, from Panama, and a skull collected by Lieutenant Couch and labeled Matamoras (No. 1388).

Remarks.—In all essential features the Couch specimen agrees so closely with the skull of the type that there can be scarcely any question as to their identity, at least as compared with the large *Procyon hernandezii* and the small-toothed *P. pygmæus*. It may, perhaps, be reasonably doubted whether this individual was actually killed at Matamoras, but its presence in Couch's collection appears to be a clear indication that the species ranges far to the north of Panama.

Procyon minor sp. nov.

Type.—Young male, (permanent dentition in place but basal suture open), skin and skull No. $\frac{35417}{15481}$ U. S. National Museum. Collected at Ponite-à-Pitre, Guadeloupe, Lesser Antilles, by L. Guesde. Received from the l'Herminier museum.

Diagnosis.—Size and general appearance as in the other small members of the genus (*P. maynardi, P. pygmæus, P. pumilus*); skull with posterior extension of palate so widened that its least breadth is decidedly greater than distance from last molar to anterior border of mesopterygoid fossa.

Color.—The skin is not in good condition, having apparently been subjected to the action of some kind of preservative fluid. The color

indicates no special peculiarities; back rather uniformly clouded with black, the light element of the grizzle buffy white with an evident yellowish tinge on neck; face markings normal, the light area above eye well developed; whitish terminal area on ear large and conspicuous; tail not noticeably more yellowish than back, the black rings narrow but well defined; underparts dark wood brown thinly overlaid by the whitish longer hairs; interramial dark area narrow and ill defined.

Skull.—The skull is too young to furnish a satisfactory basis for comparison. It differs conspicuously, however, from that of other members of the genus in the unusual breadth of the posterior extension of the palate. The least width of this is 16.4 mm., the distance in median line from level of posterior edge of last molar to anterior border of mesopterygoid fossa (disregarding median spine or notch) is 12 mm. In a specimen of *P. hernandezii* of exactly the same age these measurements are respectively 15.2 and 13.8. The same narrow form is also shown by a young *P. pygmæus*. Audital bullæ with meatal portion not evidently tubular. Mandible excessively slender, its depth at front of pm_4 contained nearly 10 times in length to extremity of angular process, while in the *P. hernandezii* of same age it is contained only about $7\frac{1}{2}$ times in the same length.

Teeth.—In general the teeth resemble those of *Procyon maynardi*, the small premolars showing the same tendency to be widely placed as compared with the more crowded condition in other members of the group. The cusps of all the teeth tend to be higher and narrower than in *P. maynardi*, and the cingula of the three large upper cheek teeth are better developed.

Measurements.—External measurements of type (from skin): head and body, 440; tail, 185; hind foot, 85 (81). Skull: condylobasal length, 94.6; zygomatic breadth, 55.4; interorbital constriction, 17.8; breadth of braincase, 44.8; nasal (median), 27.2; mandible, 70.4. For dental measurements see table.

Specimen examined.—The type.

Remarks.—Although represented by a single rather unsatisfactory specimen this animal shows such marked characters that I have no hesitation in regarding it as a distinct species.

TABLE OF DENTAL MEASUREMENTS.

Name.	Upper toothrow exclusive of incisors.	Three large upper cheekteeth (crowns).	Posterior upper premolar (crown).	First upper molar (crown).	Lower toothrow exclusive of incisors.	Three large lower cheekteeth (crowns).	Posterior lower premolar (crown).	First lower molar (crown).	Second lower molar (crown).
Procyon pygmæus. Cozumel. Type	35.4	17.6	6.2 x 7.0	7.0 x 8.2	40.4	21.4	6.0 x 4.0	8.2 x 5.0	7.6 x 5.0
" " Cozumel. Female	35.4	18.0	6.4 x 7.2	7.0 x 8.2	40.0	22.2	6.2 x 4.2	8.2 x 5.2	8.0 x 5.0
" " Cozumel. Young male	. . .	18.0	6.2 x 7.0	7.2 x 8.2	. . .	22.2	6.0 x 4.0	8.4 x 5.2	8.2 x 5.0
Procyon pumilus. Yucatan. Type	39.4	21.2	8.0 x 9.0	9.2 x 9.8	45.0	26.2	7.4 x 5.0	10.0 x 6.4	9.0 x 6.0
" " "Matamoras"	39.2	20.6	8.0 x 9.2	8.6 x 9.2	43.6	24.6	7.0 x 4.6	10.0 x 6.0	8.4 x 5.4
Procyon maynardi. Bahamas. Adult male.	38.6	20.0	7.0 x 8.0	7.8 x 9.0	45.2	24.8	6.6 x 4.8	9.0 x 5.4	9.4 x 5.4
Procyon minor. Guadeloupe. Type	. . .	20.0	7.4 x 8.0	7.8 x 8.6	44.4	25.0	7.0 x 4.6	9.0 x 5.4	9.0 x 5.2
Procyon hernandezii. Colima	45.4	24.8	9.8 x 10.4	9.6 x 10.8	51.6	29.2	8.8 x 6.2	11.2 x 6.8	10.0 x 6.4
" " Colima	43.6	23.0	8.6 x 9.6	9.0 x 10.6	50.0	27.6	8.2 x 5.4	10.4 x 6.4	9.8 x 6.0

Vol. XXIV, pp. 7–12 January 28, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE NOMENCLATURE OF THE SCYPHOMEDUSÆ.

COMPILED BY T. D. A. COCKERELL.

Having become greatly interested in Dr. A. G. Mayer's great work *Medusæ of the World* (Carnegie Institution, 1910), and being at the same time concerned with matters of nomenclature, I was led to take up the nomenclatural questions involved in the classification of the Medusæ, and in consequence to enter upon a correspondence with Dr. Mayer regarding a number of difficult points.

Dr. Mayer's work is so well done that it affords material for the investigation of almost any question that may arise regarding the Medusæ. From the standpoint of correct nomenclature, and in some cases proper grammatical form, fault may often be found with the names of the subfamilies, families and higher groups. The objectionable forms are of course in no case due to Dr. Mayer, but have been received from older authors who were more or less indifferent to the preferred usages of zoologists. There are certainly good reasons for adopting a fairly uniform system of nomenclature for the higher groups in zoology, and in particular the names of families and subfamilies should accord with the International Code.

In the following list I have included the Scyphomedusæ of the world down to genera (excepting those which are of quite uncertain status), and in each case have given the carefully ascertained type species of the genus. The whole list has been very kindly gone over by Dr. Mayer (who is substantially its author, although he declines to stand in that position) and approved by him, with two exceptions presently to be mentioned. In several cases, where I had suggested an innovation with a query, he ran his pencil through the query-mark; but

in one instance he deleted a change which I had (as I now recognize) mistakenly proposed.

The two exceptions concerned the genera *Phyllorhiza* and *Thysanostoma* of L. Agassiz, for which it seemed extremely desirable to take as types well-known and recognizable species, instead of the almost hypothetical forms on which these generic names were based. Unfortunately it is quite impossible under the rules to take as the type of a genus a species not originally included, or even (as in these cases) published at the time when the generic name was first proposed. In the case of *Thysanostoma* the imperfectly known type species may well represent the genus as defined by Mayer, so there is no disturbance of the nomenclature; but the original *Phyllorhiza* was probably *Cephea*, and there seems no way of avoiding a new name for *Phyllorhiza* in the sense of von Lendenfeld and Mayer.

It is proposed later to treat the Hydromedusæ in the same manner, though there are some exceptional difficulties in the way of this undertaking.

Names within square brackets are those of Dr. Mayer's work.

Order CARYBDEIDA [Carybdeidæ].
Fam. CARYBDEIDÆ.
Carybdea Pér. & Less.
marsupialis (L.).
Tamoya F. Müll.
haplonema F. Müll.
Tripedalia Conant.
cystophora Conant.
Chyropsalmus L. Ag.
quadrumanus (F. Müll.).
Chirodropus Haeck.
gorilla Haeck.

Order STAUROMEDUSIDA [Stauromedusæ].
Fam. LUCERNARIIDÆ.
Subf. TESSERANTHINÆ.
Tesseranthe Haeck.
connectens Haeck.
Subf. LUCERNARIINÆ.
Depastrum Gosse.
cyathiforme (M. Sars).

Stenoscyphus Kish.
inabai (Kish.).
Thaumatoscyphus Kish.
distinctus Kish.
Lucernaria O. F. Müll.
quadricornis O. F. Müll.
Kishinonyea Mayer.
nagatensis (Oka).
Haliclystus Clark.
auricula (Rathke).
Halimocyathus Clark.
platypus Clark.
Capria Antipa.
sturdzii Antipa.

Subf. LIPKEINÆ.
Lipkea Vogt.
ruspoliana Vogt.

Order CORONATÆ.
Fam. PERIPHYLLIDÆ.
Pericolpa Haeck.
quadrigata Haeck.
Periphylla Steenstr.
hyacinthina Steenstr.
Periphyllopsis Vanhöffen.
braueri Vanhöffen.

Fam. PARAPHYLLINIDÆ.
Paraphyllina Maas.
intermedia Maas.

Fam. LINUCHIDÆ [Ephyropsidæ].
Pelephyra Haeck.
antiqua Haeck.
Nausithoë Koelliker.
punctata Koelliker.
Linuche Esch.
unguiculata (Schw.).

Fam. ATOLLIDÆ [Collaspidæ].
Atolla Haeck.
wyvillei Haeck.

Fam. ATORELLIDÆ.
Atorella Vanh.
subglobosa Vanh.

Order SEMÆOSTOMATA [Semæostomeæ].
Fam. PELAGHIDÆ.
Pelagia Pér. & Less.
noctiluca (Forsk.).
Chrysaora Pér. & Less.
hysoscella (L.).
Dactylometra L. Ag.
lactea (Esch.).
Karagca Kish.
depressa Kish.
Sanderia Götte.
malayensis Götte.

Fam. CYANEIDÆ.
Desmonema L. Ag.
gaudichaudii (Lesson).
Cyanea Pér. & Less.
capillata (L.).
Drymonema Haeck.
dalmatina Haeck.

Fam. AURELLIIDÆ [Ulmaridæ].
Subf. DISCOMEDUSINÆ [Umbrosinæ].
Discomedusa Claus.
lobata Claus.
Parumbrosa Kish.
polylobata Kish.
Undosa Haeck.
undulata Haeck.
Diplulmaris Maas.
antarctica Maas.

Subf. STHENONIINÆ.
Sthenonia Esch.
albida Esch.
Phacellophora Brandt.
camtschatica Brandt.
Poralia Vanh.
rufescens Vanh.

Subf. AURELLIINÆ.

Aurellia Pér. & Less.

aurita (L.).

Aurosa Haeck.

furcata Haeck.

Order RHIZOSTOMATA [Rhizostomæ].

Fam. CASSIOPEIDÆ.

Toreuma Haeck.

dieuphila (Pérs. & Less.).

Cassiopea Pérs. & Less.

andromeda (Forsk.).

Fam. CEPHEIDÆ.

Cephea Pér. & Less.

cephea (Forsk.).

Cotylorhiza L. Ag.

tuberculata (Macri).

Polyrhiza L. Ag.

vesiculosa (Ehrenb.).

Fam. CATOSTYLIDÆ.

Catostylus L. Ag.

mosaicus (Quoy. & Gaim.).

Lychnorhiza Haeck.

lucerna Haeck.

Crambione Maas.

mastigophora Maas.

Mastigias L. Ag.

papua (Lesson).

Pseudorhiza v. Lendenf.

aurosa v. Lendenf.

Megamastigias n.n. (*Phyllorhiza* v. Lendenf. not L. Ag.).

punctata (v. Lendenf.).

Versura Haeck.

palmata Haeck.

Lobonema Mayer.

smithii Mayer.

Fam. LEPTOBRACHIIDÆ.

Thysanostoma L. Ag.

brachyura (Less.).

Lorifera Haeck.
lorifera (Ehrenb.).
Leptobrachia Brandt.
leptopus Cham. & Eys.
Fam. Rhizostomidæ.
Rhizostoma Cuvier.
pulmo (Macri).
Rhopilema Haeck.
rhopalophora Haeck.
Eupilema Haeck.
scapalare Haeck.
Stomolophus L. Ag.
meleagris L. Ag.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE GENERIC NAME OF THE MUSKRAT.

BY N. HOLLISTER.

For over sixty years the propriety of *Fiber* as the generic name of the muskrat has not been questioned. A careful review of the history and synonymy of the genus brings to light a surprising state of uncertainty as to the validity of this name.

Linnæus, after having previously confounded the American muskrat with his *Castor moschatus* (= *Desmana moschata*) of Asia, in 1766 recognized it as a distinct species, naming it *Castor zibethicus*. Gmelin, 1788, transferred it to the Linnæan genus *Mus*, placing it in a starred section (*cauda apice compressa*) with the *Mus coypus* of Molina. Kerr, 1792, gave this section a subgeneric name, *Myocastor*.* Link, 1795, erected the genus *Ondatra*,† with the same two component species, *Ondatra coypus* and *O. zibethicus*. Lacepède, 1799, listed a genus *Ondatra*,‡ with *Ondatra zibethicus* as the typical specific example. Presumably, he, like the others, considered the coypu congeneric with the muskrat. Cuvier, 1800, named a subgenus *Fiber*,§ based on the ondatra of his "Tableau," 1798, and Illiger, 1811, formally adopted the combination *Fiber zibethicus*.|| Various other generic names were later proposed for the animal, but these have no bearing on the case in question. Lesson seems to have been the last author to consider *Ondatra* seriously, after which the name dropped into the synonymy of *Fiber*.

* Anim. Kingd., p. 225, 1792.

† Beytr. Nat., I, pt. II, p. 76, 1795.

‡ Tabl. Mamm., p. 9, 1799.

§ Leçons, d' Anat. Comp., I, tabl. I, 1800.

|| Prodr. Syst. Mamm., p. 88, 1811.

According to Canon XXVI of the A. O. U. code (XXII of the revised edition) inasmuch as no genotypes were designated for *Myocastor* Kerr and *Ondatra* Link the latter at once became a synonym of *Myocastor*. Lacepède's *Ondatra* was of course preoccupied by *Ondatra* Link. According to the International code, however, it is necessary to fix the types of these various genera to settle their respective standings. The types of *Castor* and *Mus* are fixed by tautonymy, and Allen has, by the process of elimination, fixed the type of *Myocastor*.* It remains then only to fix the type of *Ondatra* Link. Every logical argument is in favor of naming *Ondatra zibethicus* as the type of this genus, and thus reinstate the name *Ondatra* for the muskrat. The name is distinctively applicable to the animal, and with a slightly broader interpretation of tautonymy than seems at present allowed by the code, *zibethicus* would automatically be the type, "Ondatra. *Buffon hist. nat.* X. *p.* I. *t.* I" appearing in the synonymy of Gmelin's *Mus zibethicus*. It seems unsafe to choose it as such at this late day, however, with the uncertainty as to whether Palmer (Index Generum Mammalium, Appendix, p. 951) has not already unintentionally fixed *Mus coypus* in that position. Palmer, under *Ondatra* Lacepède, 1799, states: "Not *Ondatra* Link, 1795, a synonym of *Myocastor* Kerr, 1792 (type *Mus coypus* Molina), which is a genus of Octodontidæ." That a difference of opinion regarding this question might always obtain was at once apparent when it was submitted to several nomenclatorial experts. In order to settle it definitely I, therefore, choose *Ondatra coypus* as the type of *Ondatra* Link, 1795.

This selection will, at any rate, bring about the same results by both codes; satisfy the few American mammalogists who are, unfortunately, still loyal to the A. O. U. code; and perpetuate the name *Fiber*, under which the great mass of literature relating to the animal has been published.

* *Myocastor coypus:* Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 183, 1895.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NEW LIZARDS AND A NEW TOAD FROM THE DUTCH EAST INDIES, WITH NOTES ON OTHER SPECIES.

BY THOMAS BARBOUR.

The identification of the herpetological material which I collected in the East Indies during a part of 1906–7 has just been completed. I find some points of interest regarding geographic races in several of the species, and there are other specimens which can not be referred to any form described up to the present time. A complete list is now almost ready but it seems advisable to publish the following preliminary descriptions.

Leiolepisma pullum sp. nov.

Type.—No. 7486, Museum of Comparative Zoology, from Humbolt's Bay, Dutch New Guinea, collected by T. Barbour, January, 1907.

Closely related to *L. fuscum* (D. & B.) and *L. beccarii* (Ptrs. & Doria), but differing from both these species as the appended description shows: Habit lacertiform. Fingers four, toes five; distance between the end of the snout and the fore-limb contained once and one-fourth in the distance between axilla and groin; snout obtuse. Lower eyelid with an undivided transparent disc, smaller than the ear-opening. Nostril pierced in a single nasal; supranasal absent; frontonasal much broader than long, broadly in contact with the rostral, and very narrowly in contact with the frontal; latter shield a little shorter than frontoparietal, in contact with the first and second supraoculars; four supraoculars, seven superciliaries; frontoparietal single, followed by a small interparietal, parietals forming a median suture; a pair of nuchals, and a pair of temporals border the parietals; four labials anterior to the subocular. Ear-opening oval, larger than the transparent disc; auricular lobules present, and entering the anral aperture from all sides. 42 rows of scales round the body; dorsals and laterals all distinctly tricarinate; preanal scales very slightly enlarged. The hind limb reaches a little beyond the anterior side of the fore-limb. Subdigital lamellae under the fourth toe, 32. Tail almost exactly twice as long as head and body. Color dark mahogany brown above, uniform except for

two crossing, irregular, zig-zag lines of light spots, many of which have black centers. The crossing lines enclose areas which are roughly diamond shaped. The region where these lines occur is that between the fore and hind-limbs. On each side an irregular dark band, more or less broken up into squarish blotches by white vertical lines. This lateral band is not edged below with a lighter color, but fades away gradually into the yellow of the belly. There are two light longitudinal stripes on the sides of the tail, with brown above and yellow below.

Although the great majority of the wide-ranging skinks do not seem to show any definite variations connected with the locality from which they come, nevertheless two of these lizards do separate into distinct geographic races. The first which I shall discuss is

Dasia smaragdinum (Lesson).

Lesson, Voy. Coquile Zool. II, 1830, p. 43, pl. 3, fig. 1.
Boulenger, Cat. Liz. B. M., III, 1887, p. 250.

Type locality.—Oualan, Caroline Islands.

Lesson figured and named not only this species from Oualan, but also what he called *Scincus viridipunctus* (pl. 4, fig. 1). A comparison of these figures with large series from New Guinea, Waigiu, Jobi, and New Britain islands, from the Pelew, Marshal, and Caroline islands, and then from Ceram, Ternate, Obi, and Halmahera, shows that Lesson's figure of *smaragdinum* was undoubtedly drawn from a Papuan individual. The examples are all the same and unvarying in color for three races based upon definite and unchanging color-phases which do not seem to be correlated with modifications in the squamation. All of the Papuan specimens without exception—I have before me more than 50—are vivid green over the anterior part of the body; while the posterior may be either green or may fade to a reddish buff color. This type of coloration, so far as the material in hand shows, never occurs in the Marshal, Caroline, or Pelew islands, nor from the Moluccas; and this skink may be called *D. smaragdinum smaragdinum* (Lesson), based upon pl. 3, fig. 1, the characters being there excellently shown, though the locality of the specimen evidently is incorrect. It may be mentioned here that some of the other lizards recorded or described from the Carolines by Lesson need confirmation. All of the Polynesian specimens at hand,—ten from Ebon, Marshal Islands; two from Pelew, and two from Ruk in the Caroline Islands,—are all alike and unvarying in color. This is the form represented by Lesson in pl. 4, fig. 1. It may be known as: *D. smaragdinum viridipunctum* (Lesson). The specimens from the Moluccas which I collected are as follows: two from Wahaai, one from Piru, Ceram; six from Ternate; six from Obi; two from Galela, Halmahera Island, all fall together into another series, not a single specimen varying in the least towards the two races which we have mentioned. These individuals may be taken to represent:

D. smaragdinum moluccarum subsp. nov.

Type.—Adult from Wahaai, Ceram; Museum of Comparative Zoology, No. 7481, T. Barbour, collector.

The coloration of this may be described as that of a light gray ground color, more or less irregularly spotted and blotched with dark brown and black, giving what is commonly called a salt-and-pepper appearance. The writer has seen an enormous number of these lizards alive in very many localities, and his notes, made in the field, show that no variation from these conditions came under observation.

I have published the only known record for *D. smaragdinum* occurring in Formosa (Proc. N. E. Zool. Club, IV, Nov., 1909, p. 65). This was a young example and hence can not be definitely placed in a particular color phase as all the young seem to have a more or less similar color pattern.

Colored drawings based upon notes made in the field have been made to illustrate these three races.

Cryptoblepharus boutonii (Desjardin).

Desjardin Ann. Sci. Nat. (1), XXII, 1831, p. 298.
Boulenger, Cat. Liz. B. M., III, 1887, p. 346.

Type locality.—Mauritius.

This very widely distributed species is undoubtedly frequently carried about by human agency, and therefore it appears colonized in certain localities where no definite local races have arisen. However, local races seem to occur which often may be recognized by a definite color pattern, where, as in *D. smaragdinum*, structural differences do not seem to have become definitive as yet. Thus we have from the Bonin Islands *C. b. nigropunctatus* (Hallowell); from Papuasia, *C. b. peronii* (Coctean); while Garman has described and provided notes on others (Bull. M. C. Z. LII, 1, p. 12, June, 1908). He has proposed the varietal name *paschalis* for those upon Easter Island, based upon differences which "may at least be said to indicate the process of forming new species by means of hereditary tendencies in variation." Lizards from other islands have been discussed as though they represented full species. Thus, Garman considers *C. nigropunctatus* as of equal value to *C. boutonii*, from which it has undoubtedly been derived; and he speaks of *C. poecilopleurus* as a full species "likely to have sprung from *C. boutonii*." These forms are all better considered as geographic races of a single species; and only trinomial names express this condition. From the East Indian area we know, besides *peronii*, the subspecies *furcata*, of which Max Weber collected and described five specimens which did not vary in color. My examples from New Guinea, Jobi, and Waigiu all fall under *peronii*; while on the other hand examples from Bali and Lombok differ widely in coloration from others hitherto described, and may, I believe, with justice be considered to represent two other undescribed local races, judging by what we know of the distribution of the species as a whole. Thus from Bali we have

Cryptoblepharus boutonii balinensis subsp. nov.

Type.—Museum of Comparative Zoology, No. 7480; collected at Buleleng, Bali Island, by T. Barbour.

Scales in 24 rows. Olive above, with four darker areas on the back, separated by three light olive lines, and bounded below by the olive sides. The median light line forks near the region above the axil, and the two resultant lines continue down the back, bounding a median dark area which is wide and continued to the root of the tail, which latter is olive above and below.

Cryptoblepharus boutonii cursor subsp. nov.

Type.—Museum of Comparative Zoology, No. 7479, from Ampenan, Lombok Island, collected by T. Barbour.

The coloration of this form is as follows: Middle of the back light olive bounded on each side by a dark line, each of which meets the other at the root of the tail, and fades away. Outside of these two dark lines are first a silvery white line, beginning just above the eye, and running back to the base of the tail; and below this again there are wide black lines running down each side from back of the eye to the tail; they continue down the sides of the tail only a short distance, when they break up into series of spots, and become indistinct and disappear. The lower surface is silvery white. The limbs are checked with black and white square spots. The tail is olive above, lighter below, fading to reddish towards the tip.

Colored figures are being prepared of these specimens.

After the foregoing remarks on *Cryptoblepharus* had gone into type I received a paper from Dr. Jean Roux on the Reptiles and Amphibians of the Aru and Ké Islands (Abh. Senck. Naturf. Ges., Vol. 33, 1910, pp. 211–247, pls. 13–14). On page 240–241 he discusses at considerable length what he calls *Ablepharurus boutoni* var. *keiensis* n. var. This is figured; and shows that in the Ké Islands, as in the islands of the Lesser Sunda chain, we have a perfectly recognizable race which may be known as *Cryptoblepharus boutonii keiensis* (Roux); while on page 218 he shows us that the specimens from the Aru Islands may be referred to the subspecies *peronii* (Coct.).

Among the lizards captured by the naturalists on board the U. S. F. C. Steamer *Albatross* were a number of sail-tailed lizards. These Dr. Stejneger kindly lent me for study. Among them, most fortunately, was a single specimen from Amboina, the type locality of Schlosser's *Lacerta amboinensis*.* Now, a comparison of these specimens with others which I have from the Moluccas shows that we have been confounding several

* *Lophura* has been recently used for the genus by all authors. This generic name is, however, preoccupied, so that it becomes necessary to use *Hydrosaurus* (Kaup, Isis, 1828, p. 1147). In Boulenger's list of synonymous genera, *Istiurus* (Cuvier, R. A., 2nd Ed., II, p. 41) appears before Kaup's name. It was not, however, proposed until 1839

perfectly distinct forms under one name. A fully adult specimen from Ceram agrees perfectly with the topotype taken by the *Albatross*. These two specimens, however, are different from two other adults which I shot near Weeda, Halmahera; and from the others, which came from various localities in the southern Philippines. Judging from what Max Weber says (Zool. Erg. Reise Ned.-Ind., I, 1890, p. 167), we may conclude that the examples from Celebes represent another distinct form. We have then in the genus as it stands at present,

Hydrosaurus amboinensis (Schlosser), from Amboina and Ceram.
H. weberi sp. nov., from Halmahera.
H. microlophus (Bleeker), from Celebes.
H. pustulosus (Eschscholtz) from the Philippines.

For the sake of comparison with the description of *H. weberi*, sp. nov., I add here a similar diagnosis of the specimen from Ceram. Unfortunately no examples from Celebes are available for study, though we may expect a full description of *H. pustulosus* (Esch.) when Dr. Stejneger publishes his "Herpetology of the Philippines."

A few notes on the main diagnostic characters of this species are also added, thanks to Dr. Stejneger's courtesy, and with his permission.

Hydrosaurus amboinensis (Schlosser).

Described from an adult male, M. C. Z. No. 7504, taken at Piru, Ceram, February 3, 1907, by T. Barbour.

Head small; snout rather elongate, strongly compressed, with a very inconspicuous longitudinal crest of enlarged scales in the male. Vertical diameter of tympanum contained exactly twice in the distance from the anterior border of the eye to the posterior limit of the nostril. Upper head scales minute, very strongly keeled, larger in the frontal region than between the eyes; gular scales small, granular and of very unequal size; a series of enlarged scales on each side, parallel with the lower labials, beginning at the mental and extending backward, decreasing gradually in size until they disappear almost opposite the posterior border of the eye. Dorsal and nuchal crests continuous, composed of compressed, straight, lanceolate spines on the nuchal region, and of backward-curved, almost falciform, spines on the sacral region; the dorsal crest beginning at the shoulder region and extending backward about half way to the sacrum, is composed of small, inconspicuous scales much less in size than those of the nuchal or sacral areas; dorsal scales small, imbricate, keeled, the keels directed upwards and backwards, intermixed with a very few scattered, enlarged, roundish, short-keeled scales which vary somewhat in size; ventral scales larger than dorsals, subquadrangular, smooth, arranged in regular transverse series; an area of conspicuously enlarged scales on each side of the chest just in front of the insertion of the fore-limbs. Limbs rather long; the adpressed hind-limb reaches almost to the tip of the snout. Anterior face of fore-limb with greatly enlarged scales in three complete rows. Femoral pores nine on one side, ten on the

other. Tail covered with small quadrangular keeled scales above and on the sides, with larger, more heavily keeled ones inferiorly. Caudal crest high on the male, with denticulated border; the crested portion of the tail being contained three and one-third times in the length of the tail; which is two and two-thirds times as long as head and body. Olive above, spotted and vermiculated with black. Fold in front of shoulder black.

Hydrosaurus weberi sp. nov.

Type.—Museum of Comparative Zoology No. 7505; collected at Weeda, Halmahera, February, 1907, by T. Barbour.

Paratype.—M. C. Z. No. 7506, taken at same time and place.

Type an adult male, paratype an adult female.

Head deep and massive. Snout rather short, with a prominent, upraised area covered with greatly enlarged keeled scales instead of a longitudinal crest between the nostrils; tympanum small, its vertical diameter being contained almost three times in the distance from the anterior border of the eye to the posterior limit of the nostril, which is round instead of oval as in *H. amboinensis*. Upper head scales extremely small, strongly keeled, not conspicuously enlarged in the frontal area as compared to the region between the eyes; gular scales very small, granular; row of enlarged shields on each side parallel with the lower labials, commencing from the mental, and extending to a point below the anterior third of the eye. Dorsal and nuchal crests interrupted in the shoulder region; nuchal crest composed of short, thick, compressed spines; dorsal and sacral crests with uniform, elongate, recurved spines, these being most developed in the mid-dorsal region. Dorsal scales small, imbricate, keeled, the keels directed upwards and backwards, along each side seven groups, each composed of two or three very large, roundish, plate-like scales, shortly keeled; these are not so regularly distributed in the female (paratype). Limbs rather long, the adpressed hind-limb reaching the tympanum. Five or six series of enlarged and strongly keeled scales on the anterior face of the fore-limb; these rows are surrounded by very many partially complete series of scales almost as greatly enlarged, making a strong armor over the whole anterior face of the limb as against the three rows seen on *H. amboinensis*. Femoral pores 12 on one side, 13 on the other. Tail as in *H. amboinensis*, the crested portion being contained three and two-thirds times in the entire length of the tail; which is not quite twice as long as head and body. Color uniform dark brown, lower surface more yellowish.

This species may thus be distinguished at once from the type of the genus by its massive, bull-dog head, covered above with almost uniform minute scales; its small tympanum; and its entirely different nuchal and dorsal crest, its shorter tail and by the greater number of lateral enlarged scales.

This species is named in honor of Professor Max Weber, of Amsterdam, to whom we owe so much for his studies of East Indian zoögeography.

H. pustulosus, from the Philippines, has the crest between the nostrils

much more developed; a continuous dorsal and nuchal crest of very elongate, falciform spines; a large tympanum, the vertical diameter of which is contained only one and one-third times in the distance from the anterior border of the eye to the nostril; and a head of fundamentally different shape, larger than in *H. amboinensis*, and its elongate form reminds one of this species. The head is, however, longer in specimens of the same size, and the snout is declivitous, which gives it a more acuminate appearance. There are many groups of a considerable number each of enlarged plate-like scales on the side. In this character *H. weberi* is intermediate between *H. amboinensis* and *H. pustulosus*.

The type of the new toad which forms the last notice of this paper was taken under an upturned stone on the road between Ampenan and Mataram, on the island of Lombok. It may be known as

Bufo cavator sp. nov.

Type: Museum of Comparative Zoology, No. 2670, from Ampenan, Lombok Island.

Closely related to *Bufo biporcatus* Tschudi. Crown with bony ridges, rather feebly developed, viz., a supraorbital and a parietal, forming together a straight, or nearly straight, line, and a short orbital tympanic; snout short, with prominent canthus rostralis; interorbital space slightly broader than upper eyelid; tympanum distinct, circular, about $\frac{3}{5}$ diameter of eye; first finger as long as second, toes fully webbed except the fourth toe, which extends far beyond the web. Subarticular tubercles simple; two moderate metatarsal tubercles; tarsus without a fold. The hind limb being carried forward along the body, the tarso-metatarsal articulation reaches to the nostril. Upper surface with scattered warts which are not spiny; paratoids very prominent, small, almost circular. Brownish above, marbled with light yellowish; fore and hind limbs cross-barred with yellowish; beneath yellowish, throat dark brown.

This species may be distinguished from *Bufo biporcatus* at once by its much smaller tympanum, which is almost circular instead of vertical-oval. In *B. biporcatus* the upper boundary of the tympanum is formed by the orbito-tympanic ridge, which is not the case with this species. The shape of the tympanum is quite different in the two species; and in this new one the cephalic crests are not prolonged as far posteriorly as they are in *biporcatus*.

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PROCEEDINGS

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A NEW BELL-BIRD FROM AUCKLAND ISLAND.

BY OUTRAM BANGS.

Among the birds the Museum of Comparative Zoology received from Mr. H. H. Travers was one skin of an adult male Bell-Bird from Auckland Island, which upon comparison proves to be so different from *Anthornis melanura* (Sparrm.) of New Zealand or *A. melanocephala* Gray of the Chatham Islands that it, as well as its two congeners, must be given specific rather than subspecific rank. Upon inquiry I found that the U. S. National Museum had one adult male from Auckland Island from the same source as ours, and this together with their entire series of *A. melanura* and *A. melanocephala* was kindly sent me by Dr. Chas. W. Richmond, acting Curator of Birds. The two specimens exactly match and are not approached by any individual variation among skins from New Zealand or the Chathams.

The new bird may be known as—

Anthornis incoronata sp. nov.

Type from Auckland Island, No. 40,008, Museum of Comparative Zoology, adult ♂. Collected by H. H. Travers.

Characters.—Similar in general to *A. melanura* (Sparrm.) of New Zealand and *A. melanocephala* Gray of the Chatham Islands, and about intermediate in size—larger than the former, smaller than the latter; differing in color from both in the adult male (the female I have not seen) having the head almost without darker metallic gloss,—a faint metallic violet is just perceptible in a very narrow frontal band and slightly so on the ear coverts, the rest of the head is glossy oil-green, shining in certain lights with almost golden reflections. In the large Chatham Islands bird the whole head is dark, shining metallic-blue, in

the small New Zealand species the head is paler, a little less extensively shining and the color metallic-violet.

Measurements.—Type, adult ♂, wing, 96; tail, 90.5; tarsus, 28; exposed culmen, 15. No. 175,193, U. S. Nat. Mus., topotype, adult ♂, wing, 94; tail, 92; tarsus, 29; exposed culmen, 14.5. Averages of adult males of *A. melanura* are, wing, 88; tail, 84; tarsus, 25.5; exposed culmen, 14, while one fully adult male of *A. melanocephala* affords the following: wing, 100; tail, 96; tarsus, 34; exposed culmen, 15.5.

Vol. XXIV, pp. 25–28 February 24, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF SIX NEW MAMMALS FROM THE MALAY ARCHIPELAGO.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

The large collection of Malayan mammals in the United States National Museum includes representatives of the following six forms, none of which appears to have been previously described.

Pipistrellus curtatus sp. nov.

Type.—Adult female (in alcohol) No. 141,019, U. S. National Museum. Collected on Engano Island, Sumatra, December 1, 1904, by Dr. W. L. Abbott. Original number, 3785.

Diagnosis.—Resembling the Javan *Pipistrellus imbricatus*, but ear larger, muzzle shorter and crown area of anterior lower premolar much reduced.

External characters.—Size and general form essentially as in *P. imbricatus*, but tail slightly longer and foot less robust. Membranes with no special peculiarities, the wing inserted at base of outer toe. Calcar terminating indistinctly, its posterior border with a slight keel that shows no tendency to develop into a distinct lobe like that of *P. imbricatus*. Ear extending a little beyond nostril when laid forward, its general outline as in *P. imbricatus* but antitragus better developed. Head shorter and broader than in the Javan species, its general outline when viewed from above nearly circular, with slightly projecting, moderately tumid muzzle. Color after six years immersion in alcohol apparently not so dark as in *P. imbricatus*.

Skull and teeth.—The skull is at once distinguishable from that of *Pipistrellus imbricatus* by the decided reduction of rostrum as compared with braincase, a difference equally appreciable in dorsal or palatal view. Palate so much shortened that length in median line is only about equal to width between last molars. Audital bullæ as in *P. imbricatus*. Basisphenoid pits rather well defined.

Teeth as in *Pipistrellus imbricatus* except that premolars are decidedly more reduced; anterior upper premolar with crown area barely equal to half that of outer incisor; crown area of anterior lower premolar slightly

more than half that of succeeding tooth; length of crowns of the two lower premolars together decidedly less than that of first molar.

Measurements.—Type: head and body, 40; tail, 34; tibia, 14.8; foot, 7.2; forearm, 33.6; thumb, 6.2; third finger, 60; fifth finger, 45; ear from meatus, 13.6. Skull of type: condylobasal length, 11.6; zygomatic breadth, 9.0; interorbital constriction, 3.8; breadth of braincase, 7.0; depth of braincase, 5.0; mandible, 8.6; maxillary toothrow exclusive of incisors, 4.2; mandibular toothrow exclusive of incisors, 4.4.

Specimens examined.—Two, both from Engano.

Epimys maerens sp. nov.

Type.—Adult female (teeth so much worn that enamel pattern is beginning to be obscured) No. 141,193, U. S. National Museum. Collected at mouth of Mojeia River, Nias Island, Sumatra, March 11, 1905, by Dr. W. L. Abbott. Original number, 4062.

Diagnosis.—A member of the *Epimys rattus* group; color as in the dark *E. simalurensis* of Simalur Island, Sumatra, but size decidedly less, the hind foot not attaining a length of 40 mm., the maximum condylobasal length of skull among twelve adults, 42 mm.

Measurements.—Type: head and body, 178; tail, 168; hind foot, 34; (32). Average and extremes of the six largest specimens: head and body, 178 (170–185); tail, 159 (155–168); hind foot, 34.9 (33.6–36); hind foot, without claws, 33.1 (32–34). Skull of type and of largest specimen in the series: condylobasal length, 39.8 and 42.0; zygomatic breadth, 20.2 and 19.8; interorbital constriction, 6.8 and 6.6; breadth of braincase, 16.0 and 16.0; depth of braincase at middle, 11.8 and 12.0; nasal, 14.2 and 15.2; depth of rostrum behind incisors, 8.2 and 8.0; mandible, 25.0 and 26.0; maxillary toothrow, 6.6 and 7.0; mandibular toothrow, 6.2 and 7.0.

Specimens examined.—Nineteen, all from Nias Island.

Remarks.—The Nias representative of the *Epimys rattus* group shares the dark color of the other Barussan local forms. The upper parts have more of the buffy cast than is usual in *E. simalurensis* and the belly is a clearer smoky gray, but the difference is very slight. In size there is a marked contrast with *E. simalurensis* and *E. lugens*, in both of which the length of the hind foot usually exceeds 40 mm., and the condylobasal length is usually more than 45 mm. In both size and color the series is remarkably uniform. Two Nias specimens, however, represent a light colored species essentially like *Epimys neglectus* (Nos. 121,862 and 141,184); this animal has probably been artificially introduced.

Epimys barussanus sp. nov.

Type.—Adult male (teeth moderately worn), skin and skull No. 141,208, U. S. National Museum. Collected at mouth of Mojeia River, Nias Island, Sumatra, March 10, 1905, by Dr. W. L. Abbott. Original number, 4016.

Diagnosis.—A member of the *Epimys ceramoriventer* group resembling the previously known species in general appearance, but size decidedly greater, and skull with anterior portion of rostrum widened.

Color.—The color does not differ essentially from that of *Epimys cremoriventer*, though the ochraceous of the back is duller (less yellow) and the intermingling of blackish hairs is somewhat more conspicuous. Tail more noticeably blackish than in *E. cremoriventer*, its annulations coarser and more evident.

Skull and teeth.—Aside from its conspicuously greater size the skull of *Epimys barussanus* differs from that of *E. cremoriventer* in a distinct broadening and deepening of anterior portion of rostrum at once appreciable on comparison of specimens. Contrast between width of nasals anteriorly and posteriorly more evident than in the smaller animal. Teeth with no peculiarities of form.

Measurements.—Type: head and body, 173; tail 194; hind foot, 34 (32). Skull of type: condylobasal length, 36.6 (33.2);* zygomatic breadth, 18.2 (16.4); interorbital constriction, 6.6 (6.0); breadth of braincase, 15.4 (14.8); depth of braincase at middle, 11.0 (10.0); nasal, 14.2 (13.2); depth of rostrum behind incisors, 8.0 (6.8); mandible, 21.8 (20.0); maxillary toothrow, 7.2 (6.0); mandibular toothrow, 7.0 (6.0).

Specimens examined.—Four, all from the same locality as the type.

Epimys mengurus sp. nov.

Type.—Adult male (teeth moderately worn), skin and skull No. 125,021, U. S. National Museum. Collected at Bukit Menguru, Billiton Island, Sumatra, August 14, 1904, by Dr. W. L. Abbott. Original number, 3581.

Diagnosis.—Like *Epimys cremoriventer* but with relatively longer tail, smaller teeth and more slender skull; nasals showing a tendency to widen anteriorly as in *E. barussanus*.

Measurements.—Type: head and body, 134; tail, 182; hind foot, 26 (25). Skull of type: condylobasal length, 30.6; zygomatic breadth, 15.0; interorbital constriction, 5.6; breadth of braincase, 13.4; depth of braincase at middle, 9.8; nasal, 12.2; depth of rostrum behind incisors, 7.0; mandible, 17.2; maxillary toothrow, 5.8; mandibular toothrow, 5.6.

Specimens examined.—The type, from Billiton; also two immature individuals from Banka (Nos. 124,887 and 124,889) probably referable to the same form.

Epimys batus sp. nov.

Type.—Adult female (teeth moderately worn), skin and skull No. 121,792, U. S. National Museum. Collected on Pulo Pinie, Batu Islands, Sumatra, March 4, 1903, by Dr. W. L. Abbott. Original number, 2368.

Diagnosis.—A member of the *Epimys asper* group, with the large size and heavy teeth of *E. batamanus* Lyon, and *E. mandus* Lyon, but color very dark and rich, the upperparts essentially as in *E. mandus* but more strongly ochraceous, the underparts clear yellowish ochraceous-buff with only a slight trace of gray in region of chin.

Measurements.—Type: head and body, 133; tail, 107; hind foot, 32 (30.4). Two adult females: head and body, 135 and 146; tail, 105 and

* Measurements in parenthesis are those of an old male *Epimys cremoriventer* with much worn teeth (No. 104,154, The Dindings).

105; hind foot, 30 (28.6) and 31 (29). Skull of type: condylobasal length, 31.4; zygomatic breadth, 16.0; interorbital constriction, 6.0; breadth of braincase, 14.2; depth of braincase at middle, 10.0; nasal, 11.2; depth of rostrum behind incisors, 6.6; mandible, 19.0; maxillary toothrow, 5.8; mandibular toothrow, 5.8.

Specimens examined.—Three, all from Pulo Pinie.

Ratufa bicolor major subsp. nov.

Type.—Adult female (skin and skull) No. 155,666, U. S. National Museum. Collected at Tjibodas, Mt. Gedé, Java, alt. 4,500 ft., August 15, 1909, by Wm. Palmer (Bryant Expedition). Original number, 505.

Diagnosis.—Similar to *Ratufa bicolor bicolor* of the lowlands of eastern Java but larger.

Measurements.—Type: head and body, 365; tail, 435; hind foot, 87 (80). Skull of type (teeth moderately worn): condylobasal length, 70.4 (66.0);* zygomatic breadth, 45.8 (43.6); interorbital constriction, 28.2 (25.8); postorbital constriction, 21.2 (21.8); mastoid breadth, 33.4 (32.0); nasal, 25.8 (22.0); greatest combined breadth of nasals, 13.4 (13.2); mandible, 47.0 (45.2); maxillary toothrow (alveoli), 13.6 (13.8); mandibular toothrow (alveoli), 14.0 (14.2).

Specimens examined.—Three, all from the same locality as the type.

* Measurements in parenthesis are those of an old female (teeth much worn) from Tjimanggoe, Java, the largest in a series of twelve skulls of the lowland form.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

TWO NEW BIRDS FROM THE ISLAND OF MOLOKAI.

BY OUTRAM BANGS.

While identifying and arranging the extensive series of Hawaiian birds in the Museum of Comparative Zoology, I noticed that both the Iiwi and Ou of Molokai showed characters by which they could be picked out easily, despite the fact that ornithologists dealing with the birds of these islands have not considered them separable. I therefore propose the following names for these two subspecies:

Vestiaria coccinea suavis subsp. nov.

Type from the island of Molokai, Hawaiian Islands; Museum of Comparative Zoology No. 15,059, Bangs Coll., adult ♂. Collected February 5, 1895, by M. J. Flood.

Characters.—Similar to true *V. coccinea* (Forster) of Hawaii; but larger, bill slightly stronger, and red of general plumage orange-vermilion instead of scarlet-vermilion.

Measurements.—Adult ♂, type: wing, 85; tail, 60; culmen, 28; tarsus, 25. Adult ♀, topotype, No. 15,058: wing, 80; tail, 55; culmen, 25.5; tarsus. 22.*

Remarks.—A young male of the new form, also collected by Flood, that was changing from a spotted nestling to the red dress of the adult, when compared with similar skins from Hawaii, shows exactly the same difference in the shade of the vermilion portions of its plumage as do adults. While this particular difference in the shade of vermilion is very striking in the symmetrical, smooth skins of even and regular make, which I have just compared, I must confess that it probably would not be in rough skins such as some European ornithologists appear still content with. At all events I find no mention of it in literature, although Wilson did notice certain dissimilarities in size, the shape of the bill, and in the color of the nestlings, in comparing birds from these two islands.

* In a long series of true *V. coccinea* from Hawaii, the wing in adult males averages 79.6 (78–81), in adult females, 73.75 (72–75).

The island whence the type of *V. coccinea*, brought back by Captain Cook, really came can probably never be known; it seems safe, however, to assume that it was Hawaii, as Captain Cook stopped longer there than at any of the other islands.

Psittirostra psittacea oppidana subsp. nov.

Type from the island of Molokai, Hawaiian Islands; Museum of Comparative Zoology No. 15,047. Bangs Collection, adult ♂. Collected February 8, 1895, by M. J. Flood.

Characters.—Similar to true *P. psittacea* (Gmel.) of Hawaii, and quite as large; larger, therefore, than *P. psittacea deppei* Rothsch. (now supposed to be extinct) of Oahu. In color somewhat intermediate between the two. The fully adult male compared with fully adult males of true *P. psittacea* has the upper parts paler, more yellowish,—rather nearer oil-green than olive-green, instead of the reverse; the chest much paler, about gray No. 9 of Ridgway, and without darker median streaks to the feathers, instead of gray No. 6, or rarely No. 7, the feathers with darker median streaks; middle of belly with more extended grayish white patch, and sides and flanks dull olive-yellowish instead of oil-green. The adult female is more yellowish, less olivaceous green above and the sides and flanks are dull olive-yellowish, instead of oil-green.

Measurements.—Adult ♂, type: wing, 97.5; tail, 54; culmen, 16.5; tarsus, 23.5. Adult ♀, topotype, No. 15,048: wing, 93; tail, 57; culmen, 15.5; tarsus, 22.5.

Remarks.—Both Wilson and Rothschild seem to have been aware that the Molokai Oo was not quite the same as that of Hawaii, Wilson saying: "Examples from Molokai do not present any definite points of difference, though perhaps they are somewhat duller beneath"; while Rothschild specially mentions a youngish male in his collection from that island which he considered to be about intermediate between *P. psittacea* and *P. deppei*.

The three skins—two adult males and one adult female—in our collection from Molokai are all very different from any in a large series, including many adults and young of various ages from Hawaii.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DIAGNOSES OF SOME NEW FORMS OF PICIDÆ.

BY ROBERT RIDGWAY.

[By permission of the Secretary of the Smithsonian Institution.]

Colaptes auratus borealis subsp. nov.

Type from Nulato, lower Yukon R., Alaska. No. 49,922, U. S. Nat. Mus. Adult male. June 23, 1867. W. H. Dall.

Similar to *C. a. auratus* and *C. a. luteus* in coloration, but decidedly larger than the latter, much larger than the former. Adult male (type): Wing, 170; tail, 113; exposed culmen, 36.5; tarsus, 30; outer anterior toe, 23.

The case of *Colaptes auratus* is precisely parallel to those of *Dryobates villosus* and *D. pubescens*, all three species gradually increasing in size from the extreme southern to the extreme northern parts of their range, without material change in coloration. Evidently the three cases require identical treatment; and since three forms seem to best express the conditions in the two species of *Dryobates* (east of the Rocky Mts.) we can not have less than three forms of *Colaptes* without being conspicuously inconsistent. While *Colaptes auratus luteus* Bangs includes both the medium-sized specimens from the more northern portions of the United States and the very large ones from the far North, the type is an example of the resident bird of Massachusetts, though an exceptionally large one. Under the circumstances, it seems best to restrict the name *luteus* to the mid-region form, and give a new name to the large northern bird. By so doing, we have, as in the cases of *Dryobates villosus* and *D. pubescens*, a small Lower Austral or Austroriparian form, a medium-sized form of the Upper Austral and Transition life-zones, and a large form in the Canadian and Hudsonian zones.

The case of *Phlæotomus pileatus*, in its variations east of the Rocky Mountains, is nearly the same, but different in this respect: The species does not extend so far northward, and the lines separating (somewhat arbitrarily, as in the other species) the ranges of the two more southern forms are shifted farther southward; the extreme southern form, instead of inhabiting the Lower Austral zone as a whole, being restricted to middle and southern Florida.

Colaptes chrysoides mearnsi subsp. nov.

Type from Quitovaquito, Arizona. No. 132,871, U. S. Nat. Mus. Adult male. February 2, 1894. Dr. Edgar A. Mearns, U. S. A.

Similar to *C. c. chrysoides* but decidedly larger and paler, with pileum more strongly cinnamomeous, black bars on back, etc., narrower, spots on outer web of primaries more conspicuous (primary coverts also sometimes spotted), gray of throat, etc., lighter, and spots on under parts usually smaller. Adult male (type): Wing, 146; tail, 96; exposed culmen, 35.5; tarsus, 27; outer anterior toe, 23.

There are apparently three easily characterized geographic forms of this species, as follows:

Colaptes chrysoides chrysoides (Malherbe). Southern Lower California.

Colaptes chrysoides brunnescens Anthony. Middle Lower California.

Colaptes chrysoides mearnsi Ridgway. Arizona, extreme southeastern California and northern Lower California, and southward to southern Sonora.

Centurus chrysogenys flavinuchus subsp. nov.

Type from Acapulco, Guerrero, southwestern Mexico. No. 154,935, U. S. Nat. Mus. (Biological Survey Coll.). Adult male. January 13, 1895, Nelson and Goldman.

Similar to *C. c. chrysogenys* (Vigors)* but adult male with nape bright orange-yellow (instead of orange-red), strongly contrasted with red of crown; adult female with nape yellow, instead of orange or orange-red. Adult male (type): Wing, 124; tail, 75; exposed culmen, 26; tarsus, 21.5; outer anterior toe, 20.

Centurus uropygialis brewsteri subsp. nov.

Type from Santiago, southern Lower California. No. 151,827, U. S. Nat. Mus. Adult male. November 22, 1887, M. Abbott Frazar.

Similar to *C. u. uropygialis*, of Arizona, etc., but smaller, with relatively (often absolutely) larger bill; bars on back, etc., averaging decidedly narrower, black bars on lower rump and upper tail-coverts narrower and more numerous, and white bars on lateral rectrices, as well as black ones on inner web of middle rectrices, narrower. Adult male (type): Wing, 129; tail, 79.5; exposed culmen, 30; tarsus, 23; outer anterior toe, 18.

Chloronerpes rubiginosus trinitatis subsp. nov.

Type from Princestown, Trinidad. No. 59,416, Am. Mus. Nat. Hist. Adult male. March 3, 1893, Frank M. Chapman.

Smaller and more richly colored than *C. r. rubiginosus*, from the arid coast district of Venezuela, the back, etc., brighter, more tawny, olive, chest more brownish dusky with narrower bars of yellowish and more or less strongly suffused with dull orange or tawny. Adult male (type): Wing, 104 mm.; tail, 61.5; culmen, 23.5; tarsus, 20.5.

* The name *Centurus elegans* (*Picus elegans* Swainson, 1827) can not be used for this species, being preoccupied by *Picus elegans* Müller, 1776.

Centurus chrysogenys chrysogenys is confined to the State of Sinaloa and Territory of Tepic.

Chloronerpes rubiginosus tobagensis subsp. nov.

Type from Tobago. No. 74,968, U. S. Nat. Mus. Adult male. May, F. A. Ober.

Similar in coloration to *C. r. trinitatis* but decidedly larger. Adult male (type): Wing, 115; tail, 66; culmen, 23.5; tarsus, 20. (Average measurements of adult males of the two forms are:—

C. r. trinitatis (5 specimens): Wing, 105.4; tail, 60.7; culmen, 22.9; tarsus, 20.

C. r. tobagensis (7 specimens): Wing, 111; tail, 65.5; culmen, 24.1; tarsus, 17.6.)

Chloronerpes rubiginosus meridensis subsp. nov.

Type from near Merida, Venezuela. No. 100,734, Am. Mus. Nat. Hist. Adult male. S. Briceño Gabaldon.

In coloration nearest *C. r. uropygialis* from Costa Rica and Panama, but posterior under parts more strongly barred, and bill more slender. Adult male (type): Wing, 121 mm.; tail, 73; culmen, 22.5; tarsus, 21.

(Another adult male from Punta, near Merida, measures as follows: Wing, 123.5; tail, 74; culmen, 23; tarsus, 20.5.)

Veniliornis kirkii darienensis subsp. nov.

Type from El Reál, Darien, eastern Panama. No. 150,795, U. S. Nat. Mus. Adult male. September 3, 1889, Heyde and Lux.

Similar to *V. k. continentalis* Hellmayr, of Venezuela, but wing-coverts without yellowish spots or streaks, and under parts much more narrowly barred, the pale bars pale brownish buff instead of buffy white. Similar also to *V. k. cecilii* (Malherbe), of central Colombia, but back, etc., brighter, more tawny, and under parts more broadly barred with pale brownish buff (instead of dull whitish), and size slightly less. Adult male (type): Wing, 83; tail, 52; exposed culmen, 18.5; tarsus, 15.5; outer anterior toe, 11.5.

Phlœotomus pileatus floridanus subsp. nov.

Type from Prevatt's Camp, 24 miles s. w. of Kissimmee, Florida. No. 152,136, U. S. Nat. Mus. Adult male. March 23, 1896, R. Ridgway.

Similar to *P. p. pileatus* but decidedly blacker (that is, the general blackish color less slaty or sooty), average size less, and bill relatively shorter and broader. Adult male (type): Wing, 223; tail, 151; exposed culmen, 45; tarsus, 33; outer anterior toe, 27.

The following geographic forms of this species seem to be susceptible of definition:

Phlœotomus pileatus pileatus (Linnæus). Lower Austral life-zone (except middle and southern Florida), and southern portion of Upper Austral life-zone.

Phlœotomus pileatus floridanus Ridgway. Peninsular Florida.

Phlœotomus pileatus abieticola Bangs. Canadian and Transition life-zones and northern portion of Upper Austral zone, east of Rocky Mts.

Phlœotomus pileatus picinus Bangs. Canadian and Transition life-zones of northwest coast, from British Columbia to the southern Sierra Nevada.

Scapaneus guatemalensis nelsoni subsp. nov.

Type from El Rincon, Guerrero, s. w. Mexico. No. 185,526, U. S. Nat. Mus. (Biological Survey Coll.) Adult male. May 8, 1903, Nelson and Goldman.

Similar to *S. g. guatemalensis* but decidedly smaller, black of upper parts, neck and chest less sooty (that of foreneck glossy, slightly bluish, that of chest more extended); back stripes whiter (less yellowish); lighter bars on under parts of body paler and narrower; yellow on under side of wings paler. Adult male (type): Wing, 177; tail, 96; exposed culmen, 42.5; tarsus, 32; outer anterior toe, 24.

The several geographic forms of this species (as I am able to make them out), with their respective ranges are as follows:

Scapaneus guatemalensis guatemalensis (Hartlaub). States of Oaxaca, Tabasco, and Yucatan, southern Mexico to Costa Rica.

Scapaneus guatemalensis regius (Reichenbach). Middle-eastern Mexico, in States of Tamaulipas, San Luis Potosi, and Vera Cruz.

Scapaneus guatemalensis nelsoni Ridgway. Southwestern Mexico, in States of Sinaloa, Jalisco, Colima, and Guerrero and Territory of Tepic.

Picumnus olivaceus panamensis subsp. nov.

Type from Lion Hill Station, Panama Railway, eastern Panama. No. 53,959, U. S. Nat. Mus. Adult male. J. McLeannan.

Similar to *P. o. granadensis* but smaller, coloration decidedly more brownish olive, pileum much duller black, and feathers of malar region and chin more narrowly margined with black or with these markings sometimes obsolete. Adult male (type): wing, 50; tail, 24; exposed culmen, 12; tarsus, 12.5; outer anterior toe, 10.5.

The following seem to me to be well-defined geographic forms of this species:

Picumnus olivaceus olivaceus (Lafresnaye). Central Colombia.

Picumnus olivaceus granadensis (Lafresnaye). Western Colombia.

Picumnus olivaceus panamensis Ridgway. Eastern Panama.

Picumnus olivaceus flavotinctus Ridgway. Western Panama and Southwestern Costa Rica.

Picumnus olivaceus dimotus Bangs. Caribbean slope, Nicaragua and Honduras.

Balanosphyra gen. nov. (*Picidæ*).

Type.—Picus formicivorus Swainson.

Medium sized Picidæ similar to *Melanerpes* but with antrorse prefrontal feathers ("nasal tufts") developed into conspicuous dense tufts; feathers of breast broad, imbricated, and firm; eighth, seventh and eighth, or sixth, seventh and eighth primaries longest; ninth primary nearly as long

as fifth, and tenth (outermost) relatively much smaller (only about one-fourth as long as ninth), narrower, and more accuminate.

(βάλανος, an acorn; σφῦρα, a hammer.)

Species and subspecies:

1. *Balanosphyra formicivora.*
   - *a. Balanosphyra formicivora formicivora* (Swainson).
   - *b. Balanosphyra formicivora aculeata* (Mearns).
   - *c. Balanosphyra formicivora bairdi* (Ridgway).
   - *d. Balanosphyra formicivora angustifrons* (Baird).
   - *e. Balanosphyra formicivora albeola* (Todd).
   - *f. Balanosphyra formicivora striatipectus* (Ridgway).
2. *Balanosphyra flavigula* (Malherbe).
3. *Balanosphyra xantholarynx* (Reichenbach).

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PROCEEDINGS

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BIOLOGICAL SOCIETY OF WASHINGTON

GENERAL NOTES.

THE TYPE LOCALITY OF *MELLIVORA ABYSSINICA*.

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At the time of publishing the description of *Mellivora abyssinica* the locality from which the type specimen came was known no closer than "vicinity of Adis Ababa, Abyssinia," and was so given in the original diagnosis.* A letter, recently received at the National Museum from the collector, the Hon. Hoffman Philip, gives the exact locality where the specimen was killed as near the "Suksukki River, a small stream which connects Lake Zwai with Lake Hora Schalo; about midway between the two lakes, which with others lie between 7° and 8° north latitude, and between 38° and 39° longitude east. Altitude 4,500 to 5,000 feet."

—*N. Hollister.*

DISCOVERY OF A FOSSIL DELPHINOID CETACEAN, WITH TUBERCULATE TEETH.

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Among the fossil remains of cetaceans obtained a short time since by the National Museum from the Miocene formation of Maryland, is a nearly complete skeleton of a porpoise, which, on examination, proves to be a delphinoid form, that is, a species which may be referred to the family Delphinidæ, but has tuberculate teeth. This important specimen enables us to solve, in part, the hitherto unsolved problem of the origin of the typical porpoises of to-day. It now appears unquestionable that they were derived from forms having teeth with tuberculate or serrate crowns, rugose enamel, and anterior and posterior longitudinal ridges. This form of teeth is indicated in the recent delphinoid genus *Steno*, in which the crowns have rugose enamel, and, as I have lately discovered, traces of anterior and posterior ridges.

The beak in the fossil species is short and broad, the symphysis of the mandible moderately long, as in *Steno*, the supraorbital plates of the frontal large, the cervical vertebræ all free, the atlas with a single transverse process, the thoracic, lumbar, and caudal vertebræ short, the transverse processes of the lumbars long, narrow, and not expanded at the extremity.

* Smiths. Misc. Coll., Vol. 56, No. 13, p. 1, October 10, 1910.

It is probable that the earlier ancestral forms of the Delphinidæ were allied to *Squalodon* and that the families Squalodontidæ and Delphinidæ are offshoots from a common stem, though from the little that is known of the vertebral column and limbs of the squalodonts the hypothesis still appears tenable that the Delphinidæ originated from a stock distinct from the former, but having somewhat similar tuberculate teeth.

The teeth of the fossil species have been compared with the type-teeth of *Delphinodon mento* and *D. wymani*, with the result that it can be referred with certainty to that genus, and is possibly identical with the latter species. The genus *Delphinodon*, therefore, which has hitherto been regarded as belonging to the Squalodontidæ, is now to be transferred to the family Delphinidæ.

A full description of the fossil skeleton, with illustrations, will be published by the National Museum at an early date.

—*Frederick W. True.*

NOTE ON THE MUS COMMISSARIUS OF MEARNS.

[By permission of the Secretary of the Smithsonian Institution.]

In 1905, Dr. Edgar A. Mearns described a house mouse from Davao, Mindanao, Philippine Islands, as *Mus commissarius*, basing his account on two specimens.* The U. S. National Museum contains ten additional examples of this animal, two from San Fernando de Union, Luzon, six from Tokio, Japan, and two from the vicinity of Misaki, south of Tokio. The Japanese specimens agree in all essential characters with those from the Philippines, and the series as a whole represents a form easily distinguishable from *Mus musculus* by its cranial characters. The skull is slightly smaller than that of the cosmopolitan animal, but the teeth are disproportionately reduced and the distance between the maxillary toothrows is appreciably less. The audital bullæ are also, as pointed out in the original description, somewhat reduced in size.

—*Gerrit S. Miller, Jr.*

ON THE CORRECT NAME OF THE INCA TERN.

Mr. Oberholser has shown (Smithsonian Miscellaneous Collections, Quarterly Issue, Vol. 48, part I, May 13, 1905, 61) that *Nænia* Boie is untenable as the generic name for the Inca Tern. He adopts *Inca* Jardine (Contr. Orn. 1850, 32) but unfortunately this name is also untenable on account of *Inca* Lepeletier and Serville (Encycl. Meth., Zoology, Vol. X, 1825, 380) for a genus of Coleoptera. The next available name is apparently *Larosterna* Blyth (Cat. Birds Mus. As. Soc., 1852, 293) and the species will stand as, *Larosterna inca* (Lesson).

—*J. H. Riley.*

* Proc. U. S. National Museum, XXVIII, p. 449, May 13, 1905.

NEW NAMES FOR TWO EUROPEAN VOLES.

The names current for two European members of the genus *Pitymys* can not remain in use: *Pitymys ibericus fuscus*, applied in 1908* to a Spanish animal, is invalidated by *Arvicola agrestis fuscus* of Fatio, 1900,† a synonym of *Pitymys subterraneus*,‡ and *P. selysii* (Gerbe) 1852§ is antedated by *Arvicola selysii* Bonaparte 1845‖ published as a synonym of *P. savii*. To replace these untenable names I would suggest *Pitymys ibericus pascuus* and *Pitymys druentius* respectively.

—*Gerrit S. Miller, Jr.*

NOTE ON THE SCALES OF THE OSTEOGLOSSID FISHES.

In these Proceedings, XXIII, p. 111, I described the scales of *Heterotis*. I am now indebted to Dr. Boulenger for a scale of *Scleropages formosus* (or *Osteoglossum formosum*) from Sarawak. It is very large, about 49 mm. diameter, and nearly circular. The reticulated radial pattern is wonderfully complete, and consists of intersecting curved lines which divide the scale into small areas about 1½ to 2 mm. in diameter, more or less square, but with a corner pointing to the scale-margin. The very fine circuli are moniliform throughout; it is evident that the moniliform circuli distinguish the scales of Osteoglossidæ from those of Mormyridæ, in which there is no tendency to beading. The rough greyish-brown skin is as in *Heterotis*, and very much as in the Mormyrid *Gymnarchus*.

The Eocene fossil *Dapedoglossus testis* Cope, from Wyoming, shows the characteristic Osteoglossid reticulation, but in the apical field the radii are not broken up or united; so the sculpture approaches rather the condition of the Mormyrids.

—*T. D. A. Cockerell.*

* Miller, Ann. and Mag. Nat. Hist., 8th ser., I. p. 206, February, 1908.
† Revue Suisse de Zool., VIII, p. 472.
‡ See Mottaz, Bull. Soc. Zool. de Genève, I. p. 159. November 15, 1908.
§ Rev. et Mag. de Zool., 2nd ser., IV. p. 159. March, 1852.
‖ Atti Sesta Riun. Sci. Ital., Torino, 1844, p. 350, 1845.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW FANTAIL FROM THE CHATHAM ISLANDS.

BY OUTRAM BANGS.

Several years ago the Museum of Comparative Zoology received from Mr. H. H. Travers a collection made in Snares, Auckland, Chatham and Antipodes islands. It contained one skin of a *Rhipidura* from the Chathams (probably Mangare, though the label says merely Chatham Islands) that differs in several respects from New Zealand specimens of *Rhipidura flabillifera* (Gmel.).

As this island form appears to be unnamed it may be known as—

Rhipidura flabillifera penitus subsp. nov.

Type from the Chatham Islands, No. 39,984, Museum of Comparative Zoology, adult ♀. Collected by H. H. Travers.*

Characters.—Similar in general to true *R. flabillifera* (Gmel.) of New Zealand, but tail longer and larger—each rectrice wider; two central rectrices grayish or hoary black instead of brownish black and with a white stripe 3 mm. wide fringing the inner web for the apical half of the feather and joining the white tip which is more extensive.

Measurements.—Type adult ♀: wing, 76; tail, 99; culmen, 8.5; tarsus, 19.5. In a series of six skins of true *R. flabillifera* from New Zealand of which only two—a male and a female—had the sex determined by the collector, the wing varies in length from 70 to 75, and the tail from 91 to 94.

* Unfortunately the skins we had of Travers had no data other than locality and sex.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTION OF A NEW *DRYONASTES* FROM CHINA.

BY J. H. RILEY.

[By permission of the Secretary of the Smithsonian Institution.]

In a small lot of birds collected by Arthur de C. Sowerby in the provinces of Shansi and Shensi, China, there is a single specimen resembling *Dryonastes perspicillatus* but paler throughout and in my opinion represents a recognizable geographical race. It may be known from the following description:

Dryonastes perspicillatus shensiensis subsp. nov.

Type, No. 212,067, Collection of the U. S. National Museum. Adult male. Fifteen miles south of Si-an-fu, Shensi, China, 1,500 feet altitude, February 28, 1909. Collected by Arthur de C. Sowerby.

Subspecific characters.—Similar to *Dryonastes p. perspicillatus* GMELIN of south and south-east China, but much paler both above and below and with the feathers of the throat and neck with a mere indication of a dark shaft-streak.

Description.—Forehead, supra-orbital, lores, and auriculars, black, forming a mask; crown, cervix, and occiput smoke gray, deepening into brownish on the upper back, all the feathers with very narrow edgings and indistinct shaft-streaks of hair brown; back and rump broccoli brown; upper tail-coverts isabella color; throat, jugulum, and sides of neck, smoke gray, the feathers of the throat and jugulum with hardly perceptible dusky shaft-streaks; breast, abdomen, and wing-lining, pinkish buff; thighs buff; crissum ochraceous; carpo-metacarpal bordered with clove brown; wings externally color of the back; the primaries and secondaries blackish on the inner web and then edged with buffy towards the base of the feathers; tail wood brown, all the feathers broadly tipped with black, except the middle pair, the black increasing towards the outer pair where it occupies about half the feather and extends some distance up the outer web. Wing, 134; tail, 155; culmen, 25.5; tarsus, 41.5; middle toe, 25.5 mm.

Remarks.—Besides the paler colors, *Dryonastes perspicillatus shensiensis* has the feathers of the crown and cervix less strongly edged with hair brown; the middle tail feathers are wood brown while in *D. p. perspicillatus* they are mars brown. Shensi seems to be out of the given range of *D. p. perspicillatus* and in a different faunal area.

Among the birds from the type locality of the above described race there was a single specimen of *Nannus troglodytes idius* (Richmond), which extends the range of this bird considerably to the west.

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OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

MARINE BIOLOGI

NOTES ON *PERCOPSIS GUTTATUS* AGASSIZ AND *SALMO OMISCOMAYCUS* WALBAUM.

BY WILLIAM CONVERSE KENDALL.

[Published by permission of George M. Bowers, U. S. Commissioner of Fish and Fisheries.]

At the meeting of the Boston Society of Natural History of November, 1848, Professor Louis Agassiz gave an account of two fishes obtained by him at Lake Superior, which he regarded as the types of new genera. Regarding one of these Agassiz said (Proc. Bost. Soc. Nat. Hist. IV, 1851, pp. 80–81): "The first of these two new species is a small fish, five or six inches long, in general shape resembling a *Leuciscus*. It has the adipose fin of the Salmonidæ, but not the jaws of that family; these strongly resemble those of the *Percoids*. In its scales which are serrated on their margins, it also resembles the *Percoids*. Its characters are sufficiently peculiar to justify the establishment of a new family from this single species. Fossil species with similar characters are found in the Cretaceous formation. This is the second of the old 'fashioned' fishes, so to speak, corresponding in their structure to fossil species, which has been observed in this country. The other, the *Lepisosteus*, is the only living representative of a large family of fossil species.

"The existence of these two species has undoubtedly reference to the fact, that America is the oldest extensive continent which has been upheaved above the level of the sea."

He called the genus "Percopsis on account of its resemblance to the Percoids."

In his Lake Superior, 1850, Agassiz gives a fuller description of the genus and states that his "new genus, Percopsis, is just intermediate between Ctenoids and Cycloids: and that is what an ichthyologist, at present, would scarcely think possible—a

true intermediate type between Percoids and Salmonidæ, and should be considered as the type of a distinct family, under the name of Percopsides."

Following which is a complete description of the species which he names *Percopsis guttatus*, remarking that the species was found in great abundance at the "Sault St. Mary, at Michipictin and at Fort William."

It seems that the Rev. Zadock Thompson, author of "History of Vermont, Natural, Civil and Statistical," had discovered the same fish and named it, without publication however, some time before Agassiz announced his discovery.

Concerning which Mr. Thompson has the following in the second edition of his History, 1853, Appendix, p. 33.

"The first knowledge I had of this fish was in the summer of 1841, when I found a specimen of it, 5 inches long, which was dead, and had been drifted up by the waves on the lake shore in Burlington. On examining it I found it to possess the adipose and abdominal fins of the trout, but in its teeth, gill-covers and particularly in its hard, serrated scales, to bear considerable resemblance to the perch family. After searching all the books within my reach without finding it described I concluded that it might be new, both in genus and species, and accordingly, in allusion to the above-mentioned properties, I described it in my journal under the provisional generic name of *Salmoperca*. A notice of this fish was omitted in my History of Vermont, published in 1842, because I had then only one specimen, and upon that one, with my little experience, I did not think it prudent to found a new genus and species. When Professor Agassiz was at Burlington in 1847 I submitted the above-mentioned specimen to his inspection, having at that time obtained no others. At first sight he thought it might be a young fish of the salmon family, but upon further examination he said it was not a salmon, nor any other fish with which he was acquainted.

"During the summer of 1847 I found three other specimens of this fish, dead, on the lake shore. One of these I took with me to Boston in September to the meeting of the Association of American Geologists and Naturalists, and put it into the hands of my friend, D. H. Storer, M. D., with a request that he would ascertain what it was and let me know.

"In May, 1849, I obtained from Winooski River a number

of living specimens, which I kept alive for some time; and, observing the great translucency of the living fish when held up toward the light I gave it the specific name of *pellucida*, having previously called it, in my journal, *coeta*, from its wing-like pectoral fins.

"About this time I noticed, in the proceedings of the Boston Society of Natural History, that Professor Agassiz had laid before the Society an account of a new genus of fishes discovered by him in Lake Superior, which he proposed to call *Percopsis*. Suspecting, from the brief description given of it, that it was identical with my *Salmoperca*, I wrote to Dr. Storer and inquired of him if the specimens from Lake Superior presented to the Society by Professor Agassiz were like the one I put into his hands in 1847. He wrote me that he could not say—that the specimen went out of his hands soon after he received it and he had not seen it since.

"In Professor Agassiz's Lake Superior, page 248, I find an account of his genus *Percopsis* and his species *P. guttatus*, and I have no doubt that it is identical with my *Salmoperca pellucida*. Still, I have thought it best to let it remain, in this Appendix under the name I had given."

Since Agassiz first named this species the name has withstood the vicissitudes that taxonomy has so frequently meted to many other systematic names of fishes as well as other animals.

It is perhaps unfortunate that the nomenclatural rules of priority of publication are so hard and fast that Thompson's name for this fish could not have been retained, in justice to Mr. Thompson. It is surely unfortunate that those same rules require a name however barbarous and unmeaning to be accepted if it has proper qualifications of form and priority of publication.

Accordingly it comes about that another specific termination antedating both Agassiz and Thompson, for the genus *Percopsis*, must be substituted for that of *guttatus*.

In 1784 was published the Introduction to Arctic Zoology by Thomas Pennant. In the list of Fishes of Hudson's Bay appears on page CXCII: "The *Omisco Maycus* is a new species of trout taken in May in Albany River, not exceeding four inches and a half long. It has five branchiostegous rays: first dorsal fin has eleven rays, ventral eight, anal seven, pectoral thirteen: tail forked: in the jaws are minute teeth: back, as

low as the lateral line, is of a pale color, marked with two longitudinal rows of black stelliform spots: below the lateral line the color silvery: the belly white."

Again on page 65, Walbaum's Petri Artedi Genera Piscium, Additamentum, 1792, is "18. *Salmo, Omisco Maycus*, radiis 5 membranae branchiostegae; cauda bifurca. *Pennant. Arct. Zool. introd.* p. 192. D. 11. P. 13. V. 8. A. 7. C.

"Corpus fere spithameum. Dentes in maxillis minuti. Color in dorso usque ad lineam lateralem pallidus, duplici serie macularum nigrorum, stellatarum notatus; infra lineam lateralem argenteus; sub abdomine albus. Habitat in sinu Hudsonis."

According to the rules of nomenclature ichthyologists accept all of Walbaum's names as binomial and notwithstanding its form this name falls in the same category as the others. But it seems to have been disregarded or overlooked by the systematic writers prior to Jordan and Evermann (Fishes of North and Middle America, part 1, page 487, 1896), who place it in the synonymy of *Salmo salar*, probably assuming that it was a young salmon. The description of *Salmo Omisco Maycus* and an examination of specimens of *Percopsis guttatus* conclusively show that they are specifically identical, and must be designated as *Percopsis omiscomaycus* (Walbaum), however regretable this circumstance may be.

Comparison of essential characters in Pennant's (Walbaum's) description of the *Omisco Maycus* with the same characters in Agassiz's description of *Percopsis guttatus:*

	Pennant (Walbaum)	Agassiz
1. Maximum length	4½ inches	6 inches
2. No. of branchiostegals	5	6
3. No. of first dorsal rays	11	2, 10
4. No. of anal rays	7	1, 7
5. No. of ventral rays	8	8
6. Shape of caudal fin	"forked"	"furcated"
7. No. of pectoral rays	13	12
8. Teeth	"minute"	"excessively fine"
9. Color	2 rows of black spots on side of back.	Sometimes in 2 rows

Notes applying to the above comparison.

1. Jordan and Evermann give the maximum length of *Percopsis guttatus* as 6 inches. The species will not average over 4 or 4½ inches in specimens at hand.

2. The branchiostegals are not uniformly 6. In several specimens examined by the writer there are only 5 on a side.

3. There are only eleven developed dorsal rays, the spines being small, inconspicuous and adherent to the first ray.

4. Anal uniformly with 7 developed rays with inconspicuous rudimentary spine adherent to the first ray.

5. Ventral rays are uniformly 8.

6. Caudal fin always strongly forked.

7. Pectoral varies in number of rays.

8. The teeth of even a 4½ inch trout or salmon would hardly be called "minute."

9. Seldom more than two rows of spots on the side of the back and one row along the dorsal median line.

The characters conspicuously distinguishing the *Omisco Maycus* from any Salmonoid are:

No Salmonoid has so few branchiostegal rays. *Coregonus quadrilateralis* according to Richardson, sometimes with 8 rays, comes nearest to it, but the number of anal rays in the whitefish far exceed the number in *Percopsis*.

No Salmonoid other than some white fish has so few ventral rays, and as previously mentioned the anal of the whitefish exceeds the *Percopsis* in number of rays. Besides no whitefish has teeth on its jaws.

The teeth of the salmon or trout are comparatively large.

Salmo salar is not recorded from Hudson Bay. Lowe mentions it as occurring in Ungava Bay, the most westward point of its range.

Cristivomer namaycush and perhaps one or more species of *Salvelinus* occur in the region but the characters above mentioned preclude these forms.

In his Families of Fishes, 1872 (Smithsonian Miscl. Collections), Gill included the Family *Percopsidae* in the order *Isospondyli*, to which, from the structure of the species, it would seem that it was more closely related than to the Acanthopteri, owing to the fact that the so called spines are very weak and similar to the usual simple or rudimentary rays of the Cyprin-

idae and the majority of the characters are of that order. But later another fish of the family was discovered by Eigenmann, in the Umatilla River, Oregon, still more decidedly percoid in its structure, justifying the provisional disposition of the family in the Acanthopteri by Jordan and Evermann.

This fish was described by Eigenmann and Eigenmann as a new genus and new species under the name of *Columbia transmontana*, in Science, Oct. 21, 1892, p. 233.

In apparent recognition of the generic name bestowed upon the fish by Thompson, Jordan and Evermann have established the suborder *Salmopercae* for these fishes, of which they have the following to say:

"We place provisionally as a suborder of the *Acanthopteri*, a singular group of archaic fishes, relics of some earlier fauna, and apparently derived directly from the extinct transitional forms through which *Haplomi* and *Acanthopteri* have descended from allies of the *Isospondyli*. The group shows the remarkable combination of true fin spines, ctenoid scales, and a percoid mouth, with the adipose fin, abdominal ventrals, and naked head of the *Isospondyli*. The relations of the *Percopsidæ* with such archaic spiny rayed fishes as *Aphredoderus* and *Elassoma* are certainly not remote and the close resemblance of the head of *Percopsis* to that of *Gymnocephalus* (*Acerina*) may be more than accidental."

Accordingly the classification of this little group is as follows:

Order. Acanthopteri.
Suborder. Salmopercae.
Family. Percopsidae.
Genera. { Percopsis, *omiscomaycus*.
Columbia, *transmontana*.

Key to the Genera. [After Jordan and Evermann.]

a. Dorsal fin with 2 feeble, slender spines or simple rays; anal with 1 slender spine; scales most strongly ctenoid on caudal peduncle; posterior margin of preopercle entire or with feeble crenulations; lateral line developed, the tubes small; form slender; the body translucent. *Percopsis.*

aa. Dorsal and anal each with two very strong spines; ventral spine evident; scales most strongly ctenoid on anterior part of body; posterior margin of preopercle with a few short but

strong spines; lateral line imperfect, the tubes more or less obsolete; form robust, the substance more or less opaque. *Columbia*.

Percopsis omiscomaycus. (Walbaum).

Omisco Maycus, Pennant Arctic. Zool. Introd., p. CXCII, 1784; (ibid, Second Ed. p. CCXCVIII, 1792).

Salmo Ormisco Maycus, Walbaum, Artedi Gen. Pisc., p. 65, 1792; (after Pennant).

Percopsis guttatus, Agassiz, Lake Superior, p. 286, pl. I, fig. 1 and 2, 1850.

Salmoperca pellucida, Thompson, Hist. Vermont, second ed., appendix, p. 33, with figure, 1853.

Percopsis hammondi, Gill, Proc. Ac. Sci., Phila., 1864, p. 151.

"Head $3\frac{4}{5}$; depth about $4\frac{1}{3}$; D. II, 9; A. I, 7; V. I, 8; scales 50, head slender and conical; mouth small, subinferior, maxillary not nearly reaching front of orbit. Caudal peduncle long and slender. Pale olivaceous, a silvery stripe along the lateral line, becoming obsolete forward; upper parts with obscure round dusky spots made of dark points, peritoneum silvery. Length 6 inches. Spawns in spring. Delaware River (Abbott) to Ohio River (Sloan; Gilbert); Kansas and northward; very abundant in the Great Lakes; in all streams tributary to Hudson Bay, Red River of the North, and found by Eigenmann in the Saskatchewan as far as Medicine Hat; rare in streams south of Lake Erie, although occasionally taken throughout the upper Mississippi Valley." [Jordan and Evermann.]

Specimens from Hudson Bay region in the general locality of Albany River are reported from Moose Factory, at the mouth of Moose River, emptying into James Bay or southern extremity of Hudson Bay, which is the next considerable river shown on map, south of Albany River.

Specimens also from Nelson River a long distance north of Albany River and flowing directly into Hudson Bay. [Bean in Proc. U. S. Nat. Mus., 1881, pp. 127 and 128.]

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

FOUR NEW CHINESE MAMMALS.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

Among some Chinese mammals collected by Mr. Arthur de C. Sowerby and presented to the United States National Museum are representatives of four that have not hitherto been described. They were taken in the provinces of Kansu and Shansi, northwest China.

Eptesicus serotinus pallens subsp. nov.

Type.—Adult male (skin and skull) No. 155,156, U. S. National Museum. Collected at Ch'eng-yuan-hsien, 70 miles west of Ch'ing-yang-fu, Kansu, China, August 4, 1909, by Arthur de C. Sowerby. Original number 246.

Diagnosis.—In general like the European *Eptesicus serotinus serotinus* but color somewhat less dark, particularly below, the contrast between that of dorsal and ventral surfaces evident enough to produce a slight line of demarcation along side of neck; forearm shorter than in true *serotinus;* skull tending to be rather short and broad.

Measurements.—Type: head and body, 70; tail, 50; tibia, 22; foot, 13.8; forearm, 49; thumb, 10.6; third finger, 90; fifth finger, 65; ear, 19. Skull: condylobasal length, 19.0; zygomatic breadth, 14.0; interorbital constriction, 4.6; breadth of braincase, 9.6; mandible, 15; maxillary toothrow exclusive of incisors, 7.2; mandibular toothrow exclusive of incisors, 8.2.

Specimens examined.—Four, from the following localities: Ch'eng-yuan-hsien, 70 miles west of Ch'ing-yang-fu, Kansu (altitude 4,000 feet), 1; 18 miles east of Ku-yuan-chow, Kansu (altitude 5,300 feet), 1; 80 miles southwest of Yen-an-fu, Shensi (altitude 3,500 feet), 2.

Microtus pullus sp. nov.

Type.—Adult male (skin and skull) No. 155,047, U. S. National Museum. Collected at Chiao Ch'eng Shan, 90 miles west of Tai Yuan Fu, Shansi, China (altitude 7,000 feet), October 11, 1908, by Arthur de C. Sowerby. Original number 32.

Diagnosis.—Size and general characters as in *Microtus* (*Phaiomys*) *johannes* Thomas, but color dark, the general effect approaching mars-brown instead of dull ochraceous-buff.

Color.—Upperparts a uniform fine grizzle of cream-buff and black with a distinct brownish wash on crown and along middle of back, the general effect suggesting Ridgway's mars-brown and not in the least resembling the pallid ochraceous-buff of *Microtus johannes*. Sides not so dark as back, the grizzling less evident. Underparts light cream-buff much clouded by the blackish-slate under color. Feet dull buffy white with an evident brownish wash. Tail whitish below, brownish above, not sharply bicolor.

Skull and teeth.—The skull and teeth do not differ appreciably from those of *Microtus johannes*. They are conspicuously smaller than in *M. mandarinus*.

Measurements.—Type: head and body, 104; tail, 18; hind foot without claws, 15.5; ear, 9. Skull: condylobasal length, 24.8 (27.4)* zygomatic breadth, 16.2 (17.8); interorbital constriction, 3.6 (4.0); occipital breadth, 13.0 (13.0); occipital depth, 7.0 (7.2); nasal, 6.2 (7.0) diastema, 7.8 (9.2); mandible, 16.4 (18.2); maxillary toothrow, 5.8 (6.4); mandibular toothrow, 5.8 (6.4).

Specimens examined.—Four, all from the type locality.

Allactaga mongolica longior subsp. nov.

Type.—Adult female (skin and skull) No. 155,183, U. S. National Museum. Collected 15 miles northeast of Ching-ning-chow, Kansu, China. Altitude 6,200 feet, July 26, 1909, by Arthur de C. Sowerby. Original number 204.

Diagnosis.—Similar to true *Allactaga mongolica* (Pallas), but ear and hind foot longer, and audital bullæ larger.

Measurements.—Type: head and body, 150; tail, 230; hind foot without claws, 76. Skull: condylobasal length, 38.4; zygomatic breadth, 26.0; interorbital constriction, 11.4; breadth of braincase, 19.8; depth of braincase at middle, 13.6; nasal (median), 15.4; diastema, 12.6; mandible, 24.8; maxillary toothrow, alveoli, 8.0; mandibular toothrow, alveoli, 7.8.

Specimens examined.—Twelve, all from the type locality.

Ochotona annectens sp. nov.

Type.—Adult male (skin and skull) No. 155,164, U. S. National Museum. Collected 15 miles northeast of Ching-ning-chow, Kansu, China (altitude 6,200 feet, July 27, 1909, by Arthur de C. Sowerby. Original number 225.

Diagnosis.—Similar to *Ochotona dauurica* (Pallas) from the Mongolian Plateau, but dorsal outline of skull less convex and audital bullæ slightly larger. Differs from *O. bedfordi* Thomas, of Shensi, and Shansi, China, in smaller size (particularly of skull) more convex upper cranial outline, and much smaller audital bullæ.

* Measurements in parenthesis are those of an adult male *Microtus mandarinus* from the vicinity of Tai-yuan-fu, Shansi.

Color.—As in the related species the general color is a light buff darkened by a plentiful sprinkling of black hair-tips, the buff everywhere predominating, and becoming clearer and more yellowish along sides, particularly in region of shoulder. A faintly indicated pale area between ears. Underparts and feet dull white with a slight buffy tinge; throat crossed by a broad band of dull buff, this area sometimes extending backward along median line. Ear with the usual dark marking on outer side.

Measurements.—Type: head and body, 181; hind foot, 29 (26); ear, 20. Skull: condylobasal length, 40.0 (42.4);* zygomatic breadth, 20.4 (21.2); interorbital constriction, 4.2 (4.2); postorbital constriction, 13.2 (13.8); mastoid breadth including bullæ, 20.8 (22.0); depth of braincase at middle, 11.0 (11.4); nasal, 15.0 (15.0); diastema, 9.8 (10.8). mandible, 27.2 (30.2); maxillary toothrow, alveoli, 7.4 (8.6); mandibular toothrow, alveoli, 7.4 (8.4).

Specimens examined.—Seven; six from the type locality and one from Tsai-chiah-tsuei, 116 miles east of Lanchow, Kansu (altitude 6,300 feet).

* Measurements in parenthesis are those of an adult male *Ochotona bedfordi* from Wu-tsai, Shansi, China (No. 172,601).

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NOTES ON SOME BIRDS FROM THE ISLAND OF GRENADA.

BY T. BARBOUR.

During part of August and September of the past summer, Dr. Glover M. Allen and Mr. C. T. Brues visited Grenada for the purpose of studying the fauna. Their collections are now all in the Museum of Comparative Zoology. The ornithological collection from Grenada already in the Museum was so complete that no attempt was made to preserve series of the common birds. Special efforts to secure some of the more interesting forms were rewarded by the examples upon which these notes are based.

Hybris* nigrescens noctividus subsp. nov.

Type, from St. George's, Grenada, No. 53,586, Museum of Comparative Zoology, adult male. Collected by Glover M. Allen, September 15, 1910.

Characters.—Size that of *Aluco nigrescens* (Lawrence) of Dominica, but differing as follows: tarsus somewhat longer; under parts darker in color, and much more heavily spotted with dusky; upper parts darker, and more profusely marked with larger white spots than in the owl from Dominica.

Measurements.—Wing, 230 mm.; tail, 100 mm.; tarsus, 110 mm.; culmen, 30 mm.

Remarks.—Thanks to the courtesy of Dr. Charles W. Richmond we have been enabled to compare the type of Lawrence's *A. nigrescens*, a male from Dominica (U. S. N. M. No. 77,843), as well as another from the same locality (U. S. N. M. No. 80,017), with an adult female also from this island (Bang's Coll. M. C. Z. No. 13,614). These three birds are all pale ochraceous below, somewhat mixed with whitish; while the dusky spots are confined almost wholly to the belly.

* *Hybris* is used instead of *Tyto*, which Matthews suggests (cf. Matthews, Nor. Zool., XVII, 1910, p. 500), because *Tyto*, the name for an owl, is preoccupied by *Tyta* Billberg, the name for an owlet moth. The two names have the same derivation from the Greek word τυτώ, meaning an owl.

Our Grenada material consists of the type already mentioned, and seven others, of which three are loaned by the United States National Museum; the Museum of Comparative Zoology having specimens from Bequia in the Grenadine Islands, as well as St. Vincent. All the birds from these southern islands of the Lesser Antillean chain are similar; and have the underparts tawny, somewhat darker than Ridgway's color on plate 5.

Planesticus nigrirostris personus subsp. nov.

Type, from the Grand Etang, 2,000 feet altitude, Grenada. No. 53,598, Museum of Comparative Zoology, adult male. Collected by Glover M. Allen, September 6, 1910.

Characters.—Similar to *P. nigrirostris* (Lawrence) of St. Vincent, but differing in that the upper parts are much more darkly olivaceous, less reddish olive; the lower parts more grayish, less rufescent; and the underwing covers rather paler.

Remarks.—Mr. Ridgway, in Birds of North and Middle America, has already called attention to these differences. The characters being constant, as a comparison shows, these birds may be considered separate subspecies, as he suggested possible.

Among the birds credited to Grenada was one described from a single young specimen in very bad preservation, the only one ever known, and called *Blacicus flaviventris* Lawrence.

Wells, known for so many years as a collector of Grenadian birds, tried in vain to find other specimens of this extremely rare Tyrant bird. Dr. Allen was especially cautioned to watch for it, and by rare good fortune secured an adult male in the deep forest near the Grand Etang, a lake in the central part of the island at an altitude of about 2,000 feet. This specimen was the only one which he saw, in spite of a long and careful search It was obvious at once that the bird was very different from any other *Blacicus;* and Mr. Ridgway, when he saw it, decided definitely that it was really an Empidonax; although there was no doubt as to the identity of this specimen with the remains of the type, now in the United States National Museum. As the specific name *flavirentris* is preoccupied, it becomes necessary to give this bird a new name. A note regarding its relationships, and a description follow.

Empidonax johnstonei nom. nov.

Described from an adult male, No. 53,591, Museum of Comparative Zoology; from the Grand Etang, Granada, B. W. I., 5 Sept., 1910, collected by Glover M. Allen.

This Tyrant bird apparently has been derived from *Empidonax lawrenci* Allen, of Trinidad, but it has become differentiated by isolation to a considerable extent. I have been enabled to make direct comparison with a fine male of *E. lawrencei* (American Museum of Natural History No. 59,067) thanks to the courtesy of Mr. Dewitt A. Miller.

Characters.—Similar to *E. lawrencei* but smaller; with a narrower bill;

color pattern very similar but the upper parts a very dark greenish olive, the cap and cheeks dusky; instead of dull olive green with the cap but little darker. Wing bars narrower and darker, being tawny ochraceous instead of ochraceous buff. Throat more purely white, underparts otherwise the same.

Measurements.—M. C. Z. No. 53,591, ♂: Wing, 60; tail, 54; tarsus, 14.5; exposed culmen, 12. A. M. N. H. No. 59,067, ♂: Princestown, Trinidad, March 16, 1893, F. M. Chapman, collector. Wing, 64; tail, 58; tarsus, 13.5; exposed culmen, 13.

The new specific name of this rare bird, which is especially interesting as being the only Antillean species of its genus, is given in honor of His Honor Robert S. Johnstone, Chief Justice of Grenada and dependencies, who has often aided the members of expeditions from this Museum by his kind hospitality and in many other ways.

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PROCEEDINGS

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A NEW POCKET MOUSE FROM WYOMING.

BY MERRITT CARY.

Specimens of *Perognathus* in the Biological Survey collection from Sweetwater Valley and the northern edge of the Red Desert, Wyoming, represent a well marked pale race, hitherto undescribed, of *P. fasciatus.*, This pocket mouse may be known from the following characterization:

Perognathus fasciatus litus subsp. nov.

Type from Sun, Sweetwater Valley, Wyoming. No. 160,600, ♀ ad., U. S. National Museum, Biological Survey Collection. Collected Sept. 18, 1909, by M. Cary. Original No. 1778.

Range.—Lower Sweetwater Valley and adjacent parts of Red Desert, Wyoming.

General Characters.—A little smaller than *P. fasciatus*, about the size and proportions of *P. flavescens*, but with slightly larger hind foot than either; color extremely pale; pelage very soft.

Color (September specimens).—Upperparts and sides palest shade of cream buff, sparsely lined with black-tipped hairs, the strong olivaceous tints of *fasciatus* entirely absent; underparts pure white; orbital ring, auricular spots and lateral line pale cream buff; tail indistinctly bicolor, slightly dusky above, white below; feet white.

Skull.—As in *fasciatus*.

Measurements.—Type: Total length, 128; tail vertebrae, 59; hind foot, 18. One topotype: total length, 127; tail vertebrae, 57; hind foot, 18.

Remarks.—This pocket mouse is related to *P. fasciatus* of the northern Great Plains, with which it agrees closely in all respects except color. The only specimens known—two from Sun and one from near the old Lost Soldier Stage Station 40 miles northwest of Rawlins—were collected on sandy sage and *Atriplex* flats. A September specimen from the North Platte Valley at Casper is considerably paler than typical *fasciatus* from the Yellowstone Valley, Montana, and shows an approach to *litus*.

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SOME OBSERVATIONS MADE ON LITTLE RIVER, NEAR WICHITA, KANSAS, WITH REFERENCE TO THE UNIONIDÆ.*

BY H. WALTON CLARK AND GEORGE H. GILLETTE.

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Little Arkansas River, more commonly known locally as Little River, is one of the largest northern tributaries of the Arkansas River in Kansas. It rises in the great wheat fields of central Kansas and takes a winding southeasterly course, emptying its waters into the Arkansas River at Wichita. The country through which it flows is wholly an agricultural region, broad fields of corn occupying the bottom land lying next to the stream on each side, while on the higher land farther away lie extensive wheat fields. Little River, in marked contrast with the usual type of western stream, keeps up a steady flow throughout the year, and is not materially affected by the dry season of July, August and September. This would seem to indicate that the stream is fed by numerous springs or underground flow. The upper course was not examined, but in the lower course the well-water of the bottom lands is reached at a depth of from 15 to 20 feet, which is about the depth of the banks of the stream. The water is unusually uniform in temperature, being cooler in summer than other streams of the vicinity, and abnormally warm in winter, so that it is rarely ever frozen over very thickly even in the coldest weather, and in some portions it has never been known to freeze entirely over. These circumstances also tend to indicate that the river owes its steady flow

* The field investigations on which this paper is based were made by the junior author in August, 1910.

in a considerable measure to many springs, or that its bed lies about on the level of the underground flow.

The water is moderately clear, excepting after heavy rains, when it has a dark gray appearance. This is in marked contrast to the waters of the Arkansas River proper, the waters of which are light ashy in color at normal stage. The banks of Little River are lined with trees and underbrush. Among the trees are found cottonwood, willow, birch, walnut and elm, the trees and underbrush extending back from a few to several rods. The banks on one side are rugged and steep, while on the other they are low and in some places boggy,—the high and low side depending on the curvature of the stream; on the convex side of the curve will be found the high bank, and on the opposite or concave side is the low and boggy portion.

Observations were made from near the mouth of the river to about 10 miles upstream, near Valley Center. About two miles above Wichita a dam, known as Sullivan's dam, has been built, for the purpose of dividing the flow of the river, causing a portion of the flow to run through the eastern part of the city. It is said that this dam was built for two purposes: (1) to protect the city from overflow and (2) to furnish means of flushing a small stagnant creek, Chisholm Creek, which flows through the eastern part of the city, and into which the refuse of manufacturing plants, packing houses, etc., is dumped.

This dam is built principally of cement, is 4 to 6 feet high and from 50 to 75 feet long. As it has no fishway, the only means by which fish below the dam could get up above would be by passing down stream into the Big Arkansas and then up Chisholm Creek, and finally pass through this artificial ditch or cut-off to the waters above the dam. At the head of the ditch near the dam is a floodgate, also built of cement. When the water in the river is running high this gate is kept closed, so as not to let too much water into Chisholm Creek; during low water, however, the gate is always kept open.

Above the dam the river is considerably deeper than below; it has a much slower current, and spreads out to a breadth of from 75 to 100 feet. Most of the collecting was done above the dam. This was very difficult because the bottom was full of broken logs, rubbish, etc. The bottom consists mostly of muck and coarse gravel, with very little shifting sand, the

gravel being in nearly every case in the center of the stream, and the black muck along the shores and in all the eddies.

About 100 shells were collected. While the shells were not especially abundant, excellent examples of some of the good commercial species are present; among them the heelsplitter (*Symphynota complanata*), buckhorn or pistolgrip (*Tritogonia tuberculata*), yellow sandshell (*Lampsilis anodontoides*) and mapleleaf (*Quadrula lachrymosa*).

Many of the specimens, especially of the lighter-shelled species such as the floater (*Anodonta grandis*) and heelsplitter, were obtained in the eddies and protected places in the stream where there was very little current. The heavier-shelled species, such as the buckhorn, yellow sandshell and mapleleaf were found both in the eddies and protected places, and in some instances in the swiftly running stream, but no shells of any kind were found where there was any shifting sand. A favorite place for the heavy-shelled varieties was the lower edges of the sand or gravel bars, while on the tops of these bars where the water was swifter, none was found. We were unable to determine to what extent they were found in similar situations in the deepest water, as we had no tongs or grappling hooks.

So far as we could learn no mussels were being taken from the river for commercial purposes, although we heard of a party who had obtained quite a valuable collection of pearls from mussels taken in the river. In many of the specimens taken, small poorly developed pearls were found, but not of sufficient size and quality to be of much value.

Observations were also made on the Big Arkansas above Wichita on August 26. The river at this point is wide and shallow, the water at this time covering only about one-fourth of the bed. The main channel of the stream did not follow the center of the bed, but crossed diagonally from one side to the other. The current was swift and carried with it a large amount of shifting white sand which gave the water a yellowish creamy appearance. About 3 miles were covered during these observations. Owing to so much shifting fine sand and the changing of the main channel of the river during high water, it is impossible for mollusks requiring the support of a permanent bottom to exist in this river at the place of observation. In this three-mile course only one valve of a mussel shell was found and this

was picked up in a rubbish pile. It was bleached and very brittle, and gave evidence of having been carried a long distance. It had no doubt been washed into the river from one of its tributaries.

List of Species.

1. **Quadrula pustulosa** (Lea).

WARTYBACK.

There are 15 examples of this species, 12 from near Wichita and 3 from Valley Center. These are all rather small or medium-sized shells and quite uniform in character, being markedly compressed and unusually smooth, most of them being entirely free from elevations and the most pustulous one containing a few very low, hardly perceptible nodules near the ventral border. The whole collection presented a considerable difference from *Q. pustulosa* as usually seen, and it was only after some consideration and comparison that they were identified as this species. They represent the form originally described as a distinct species under the name *Unio schoolcraftii*. This flat, smooth form is of occasional occurrence in collections, and examples are now and then found mixed in with beds of the more common inflated pustulous form. This is our first experience in finding it the predominant form. The existence of this and intergrading forms, along with other aberrant and peculiar types, has long made *Q. pustulosa* a puzzling species. The history of the study of this species would be merely an account of the various attempts to assemble a motley but well-connected series of forms, and authorities differ somewhat as to the number of forms to include. Baker* speaks of having before him at one time 19 different varieties of *Q. pustulosa* from a number of States, and Call† discusses its variability and synonymy at considerable length, and says: "From the Little Arkansas, at Wichita, Kansas, come numbers of magnificent examples of *schoolcraftii*, some entirely covered with pustules, others absolutely devoid of even a semblance of one; indeed the writer's collection contains some fifty examples from that stream, exhibiting every phase of nodulation from absolutely smooth specimens to those showing great numbers of small pustules. The characters of the cardinal teeth alone would have sufficed, in the hands of species mongers, to make a dozen extremely characteristic species."

In view of this statement it is rather remarkable that all our specimens should be so uniform. These smooth flattened shells are even superior to the inflated pustulous forms for commercial purposes. All our specimens, however, are of rather small size.

2. **Quadrula lachrymosa** (Lea).

MAPLELEAF.

Of this species there are 22 from near Wichita in the collection and 10 from near Valley Center. They are all of large size and very uniform in general appearance.

* Mollusca of the Chicago Area; Bull. III, part 1, Nat. Hist. Survey, Chicago Acad.

† The Unionidæ of Arkansas; Trans. Acad. Sci. St. Louis, Vol. VII, No. 1, p. 43.

Compared with the species as generally known, these shells exhibit the same departures from the general type as those exhibited by the *Q. pustulosa* just mentioned; that is, they are unusually compressed, and noteworthy for the fewness and smallness of pustules which are frequently altogether absent on the posterior ridge. The sulcus is also unusually shallow. The shells, however, average larger than in ordinary collections. The nacre is white and clear, and free from stains.

Q. lachrymosa is a very fair commercial species, and the specimens from the Little Arkansas are considerably superior to the ordinary type on account of the flatness and smoothness of the shell.

3. **Symphynota complanata** (Barnes).

HEELSPLITTER.

Fifteen examples of this species were obtained, 12 from near Wichita, and 3 from Valley Center.

The heelsplitter dwells in a variety of situations such as ponds, sloughs and the more quiet portion of rivers. It varies considerably in minor details such as thickness of shell, development of wing, etc., but is generally pretty uniform in general shape. Bayou-dwelling examples are usually roughened, thin-shelled and badly stained, so that they have no commercial value. In some places (the upper Mississippi) the shells are peculiarly truncate posteriorly, as if they had abruptly stopped growing in that part of the shell.

We have had no opportunity to study the bodies of *S. complanata* from Little River. Generally speaking the species is, like the Anodontas, quite markedly subject to the attack of parasites, leeches being occasional, *Atax* frequent and *Aspidogaster conchicola* abundant. River-dwelling mussels are usually not so badly affected as those living in sloughs, and from these perfectly formed and excellent shells it would appear that parasites are not especially abundant here.

Symphynota complanata is usually too thin, and sometimes too badly stained to be of any value in the manufacture of buttons so that it is not generally regarded as a commercial species. On account of its flatness and broad expanse of shell, when it develops a sufficient thickness of shell it is an excellent button species. No other native freshwater shell except the immense thick *Quadrula heros* and the beautiful but valueless *Anodonta suborbiculata* equals it in surface, and where it can be used more buttons can be cut from a ton of shells of this species than from any other freshwater mussel.

The specimens from the Little Arkansas are exceptionally fine. We have seen none to approach them in excellence except a few examples much like them collected in Perche Creek, Missouri, by Doctors Lefevre and Curtis, of the University of Missouri. Some of the shells, both from Perche Creek and Wichita, are unusually elongate, and all are remarkably smooth and heavy. The nacre is of a clear soft satiny texture, pearly white in all but 2 examples, in which it is a very faint warm yellowish pink, too faint to be more than a mere suggestion of color and very

attractive to the eye. Although they lack the iridescence of the best niggerhead material the soft satiny luster is scarcely less attractive, and these shells would make excellent button material.

Just within the nacre of one of the shells are numerous fine whitish, long, crooked tracks, each ending in a small elevation which shows dark beneath. The dark point proves, on examination, to be a larval *Atax* which has been coated over with nacre. The peculiar tendency of young *Atax* to bore entirely through the mantle, crawling along on the nacre and finally becoming covered over with a nacreous deposit, was first noticed during the past summer (1910) by the senior author in *S. complanata* from the sloughs near Fairport, Iowa. So far, we have observed it in no other species of mussel. It seems improbable that the larvæ could ever work their way out again after being thus entombed. They appear to have no other effect upon the nacre than to leave the whitish tracks ending in the low raised point already described, and both of these marks are probably soon covered up and concealed by a new growth of shell.

4. **Anodonta grandis** Say.

FLOATER.

Fifteen examples, all from near Wichita. These are all mature shells of fairly large size, of the *oratus* type. None of the shells shows the salmon-colored and diseased nacre usually frequent where parasitic trematodes are common. There are a few pearl-like blisters in some, but as a rule they are free from abnormalities. No. 41 is rather thick and No. 42 has pink nacre. The species has no commercial value.

5. **Tritogonia tuberculata** (Barnes).

BUCKHORN; PISTOLGRIP.

Three rather large shells, all from near Wichita. All are moderately elongate and have white nacre. They are of good commercial quality.

6. **Lampsilis anodontoides** (Lea).

YELLOW SANDSHELL.

One medium-sized example from near Wichita. This shell is considerably deformed and twisted, and the greater part of the epidermis is stained and unusually imbricate. Where it reaches good development, this is the most valuable of the freshwater shells.

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NOTES ON THE COLORATION OF FISHES.

BY BARTON A. BEAN AND ALFRED C. WEED.

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While it is well known that the color of fishes of the same species varies more or less it may not be amiss to call especial attention to some of the more marked changes that may be noticed. The color changes in living fishes may be due to various emotions as fright, curiosity, anger, or sexual excitement, or they may be due to environment, as the color of the bottom, the color of the water, distance of the fish from the surface or from bottom, distance from objects attached to the bottom or floating at the surface, presence in the immediate vicinity of grass, sticks, etc.

Many people who are familiar with the fact that the color and color pattern may change in the same species have an idea that this takes place slowly. We hope to show that this does not necessarily follow and will give some illustrations of color changes which we have noted in various species in aquariums, principally that of the Bureau of Fisheries at Washington, D. C.

The Large Mouth Black Bass (*Micropterus salmoides*) when viewed as an ordinarily preserved specimen usually shows more or less traces of a black lateral band. In the large specimens this may be very faint but can usually be discerned. Similar specimens of the Small Mouth Black Bass (*Micropterus dolomieu*) show no traces of this black band but are plain olivaceous in color. There are several living specimens of each species in the aquarium at the Bureau of Fisheries where we have spent some time watching the color changes. One large specimen which showed very strongly the typical black lateral band of the Large

Mouth Black Bass changed in less than two seconds, so that the band was entirely invisible and the fish appeared to be a Small Mouth Black Bass. In preserved specimens of both species the color, except for the black lateral band, is plain; that is, there are no mottlings or marmorations, but in the aquarium, where the fish are so used to seeing visitors that they pay no attention to their presence, the color may be seen to change from plain olivaceous without the black lateral band to plain olivaceous with such a band, or to a mottling of light and dark green with or without the black band. The Large Mouth Black Bass when showing the mottled color usually shows the black band; specimens of the Small Mouth Black Bass usually do not show the black band and the mottlings have a greater tendency to appear as dark cross bars. It is difficult to determine the exciting causes of these changes as fish hiding in crevices of the rocks will show both colorations and fishes swimming show both color patterns. It appears, however, that fish swimming freely or hiding in rather dark holes have a greater tendency to exhibit the plain coloration, while those resting on the bottom or swimming close to the rocks at the side of the aquarium have a greater tendency to show the marbled or mottled color pattern.

Preserved specimens of Tautog (*Tautoga onitis*) are usually nearly plain black but with more or less distinct vertical light and dark bars of about equal width. In the aquarium they show remarkable variations of these two color patterns. When swimming freely the color is usually plain black and when resting on the bottom or at the sides of the aquarium the bright pattern is visible. However, these colors are not constant and swimming fish may be seen showing the bars while those resting on the bottom show the dark color. The color changes are frequently very rapid. We have seen a fish swimming in a vertical circle about two feet in diameter showing the bright coloration only near the bottom of the aquarium and the black color in the upper half of the circle at each turn.

In the New York Aquarium at Battery Park notices are posted in front of certain tanks containing some of the tropical angel fish, calling attention of visitors to rapid changes in color and color pattern of this fish. These changes are truly marvelous. Waves of blue starting at the head pass to the tail and disappear. While one is watching the fish the color will become all

blue or all brownish or half blue and half brown, etc. Indeed the changes are too numerous to mention.

The Pigfish (*Orthopristis chrysopterus*) shows very remarkable changes in color and color pattern. There are three perfectly distinct color patterns which appear to be about equally common. One is a perfectly plain light or dark gray without spots or bars of any kind. Another has this same gray ground with several heavy black cross bars, which sometimes are more or less broken up into dark mottlings. A third shows instead of the cross bars a black line from the end of the snout to the base of the dorsal fin and along each side of this fin. Below this is a narrow light stripe with a heavy black band below it. A second dark band extends from the eye straight to the caudal peduncle. The lower edge of this band is just above the upper lip. Between this and the dark band above it is a light stripe about the same width as either of these dark bands. The upper dark band crosses the front of the head about midway between the lower band and the front of the dorsal fin. There are also a few small black lines across the front of the head which make the markings appear much like a bridle. One of these lines passes from the upper edge of the opercle to the upper edge of orbit and then across front of head. Sometimes the two sets of bars fade out except at points where they cross, giving rise to a series of square black blotches on the side of the fish. Any of these color patterns may appear instantaneously, following any other. Sometimes the change may be likened to the fading of one picture and the appearance of another in a stereopticon.

Specimens of the Pinfish (*Lagodon rhomboides*) in the aquarium show mostly a color pattern made up simply of longitudinal blue stripes of greater or less intensity on a grayish ground. However, at times black cross bars appear. The appearance and disappearance of these bars may be practically instantaneous or it may be quite slow. The ground color between the blue lines often becomes a bright shell pink.

Many of our common fresh-water sunfishes show remarkable changes in their color in life. The Common Sunfish or "Tobacco Box" (*Lepomis gibbosus*) does not show these changes so well as some of the other species. The "Green Sunfish" (*Lepomis cyanellus*), a widely distributed fish in the

Mississippi Valley, which has been introduced into the Potomac River, shows these color changes more than any other sunfish with which we are acquainted, in fact the changes of color and color patterns are almost as numerous and as rapid as in the angelfish. In addition to the normal color changes, an increase or reduction in the intensity of the color, or a change from dark to light color, due to emotions or environment, there are many other changes for which we can only guess at the cause. We shall probably never know why one fish when frightened will turn pale while another in the same aquarium will become very strongly barred. The commonest color, visible in preserved specimens, in dead fish and in fish just taken from the water, is a plain dark olivaceous with more or less dark red in the vertical fins and with two blue lines across the cheek. In the aquarium this may be seen to change to a rich golden brown with or without vertical cross bars or to a plain light color almost silvery. The vertical cross bars are sometimes as pronounced as in the Yellow Perch (*Perca flavescens*), at other times the whole side of the fish is covered with minute shining specks without any apparent regular arrangement. Any of these color patterns may appear practically instantaneously. The change from vertical bars to the plain coloration with light specks may occur apparently in a flash. Where a few specimens of approximately equal size are confined in a small aquarium these color changes may be most readily noted. The intensification in color of the largest specimen when a smaller one happens to stray into forbidden territory and the sudden paling of the latter as he retreats may be seen very frequently, especially when the fish are being fed.

The Long Eared Sunfish (*Lepomis auritus*), known also as Red Breasted Bream, is commonly a more or less yellowish fish with orange spots and mottlings over the entire body, these sometimes showing as more or less indistinct cross bars. There are many specimens of this species in the aquarium at the Bureau of Fisheries where we have watched their color changes. Most of the specimens showed a dark olive color with the vertical fins and the breast dark red. Sometimes faint cross bars show. This coloration is so similar to that of *Lepomis cyanellus* that only the position of some blue lines on the operculum and the shape of the "ear" indicated the specific difference. From

this olive coloration fishes would quickly change to a golden brown with or without dark cross bars or with bars formed of small spots slightly darker than the ground color. One fish which we watched for some time and which, by its actions, appeared to be a male more or less approaching the breeding condition was a bright yellow color mottled over the whole side with dark orange spots each about the size of a scale. The breast was a clear bright orange. The pectoral fins were a clear lemon yellow. There was hardly a trace of cross bars although at times a few could be seen quite indistinctly. This fish was observed several times and seemed to show no color changes except, on one occasion, a slight tendency of the yellow ground color to appear grayish.

The Blue Sunfish (*Lepomis pallidus*) which is known also as Bluegill, Copper Nosed Bream, Blue Bream, Black Sunfish, Roach (Sodus Bay, New York), etc., shows various color patterns. Sometimes the fish will be a plain iron color with no markings at all except the black spot on the opercular flap. At other times it is a plain yellowish green with no markings or it may show either of these colors with faint or dark cross bars, or the light ground color may be almost entirely obscured by heavy dark bars with dark mottlings between them.

In *Enneacanthus gloriosus*, a common sunfish of the vicinity of Washington, color changes may be noted which are very similar to those of *Lepomis cyanellus*. The changes from vertical dark and light bars to the coloration of bright specks is practically the same as in the Green Sunfish except that in *Enneacanthus* the heavy black stripe through the eye never, so far as we know, becomes entirely invisible.

The War Mouth (*Chænobryttus gulosus*) shows little change in color except that the extent of the dark patches varies considerably so that the same fish may be grayish mottled with black or nearly all black with a few grayish streaks. Fish caught on hook and line near Washington often show much red or dark orange in the ground color.

Some of our common fish, which are frequently seen in aquariums, as the Gar Pike (*Lepidosteus osseus*) and Strawberry Bass or Calico Bass (*Pomoxis sparoides* and *Pomoxis annularis*), apparently show no changes except an increase or reduction in the intensity of the coloration.

Preserved specimens of the Pickerel (*Esox reticulatus*) show very slight differences in color pattern, which is usually more or less of a network of dark lines on a lighter ground, but great differences in its visibility. These differences are probably largely due to the condition of the fish when taken from the water and difference in manipulation in preserving the specimen. Fishes from clear water usually have the color pattern more pronounced, while those from muddy water, particularly water of a distinctly yellow color, frequently show no traces of the color pattern when first taken and if killed in the preservative immediately will show none. However, if these fish are placed for a few minutes in clear water the color pattern becomes visible, and it may appear in cold water even after the fish has died, showing that the color cells may remain active for a time under favorable conditions. Fishes of this species swimming near the surface in the aquarium show a very strongly marked color pattern. In some of them the reticulations extend entirely over the back, while in others the back is more or less plain dark olivaceous. When these fish are resting on a bottom of clear yellow sand the vertical bars of the reticulations tend to disappear and portions of the horizontal bars also become fainter so that the markings resemble wave marks on the bottom. The color of the back becomes plain greenish yellow, except for the presence of scattered black specks resembling, in color and arrangement, black sand grains in the neighborhood. The fish resting near the surface resembles a floating stick covered with spots of light refracted by the small waves. In this species the color changes are not in the nature of a change in color pattern, but simply variations in its intensity.

In the Yellow Perch (*Perca flavescens*) the color pattern does not change, but the intensity of the black cross bars is quite variable. Sometimes they are almost invisible and the fish appears to be a clear yellow color, while at other times they are so broad and intense that the fish appears almost black. The ground color changes with the bands from a light yellow to a dark yellowish gray.

The Sea Robin (*Prionotus evolans*), the Puffer (*Spheroides maculatus*), and the Filefish (*Alutera scripta*) show no change in the color pattern, but considerable changes from golden to grayish in the ground color. Specimens of the Sea Robin

which had buried themselves in the sand were light gray with black markings, while those that were swimming were various shades of yellow and brown marked with darker brown.

Early in the summer of 1908 a small catfish (*Ameiurus sp.*) was taken in a dip net in the Chesapeake and Ohio Canal, at Chain Bridge, near Georgetown, D. C. When first taken it was entirely black. This color persisted for several days and was then replaced by a most unexpected pattern. The body was black, but at the base of dorsal, adipose dorsal, anal and caudal fins was a narrow white band so that each fin appeared cut off from the body, which seemed to be a little piece of black stick with some little pieces of rotted leaves (the black part of the fins) near it. The caudal fin was in reality truncate, but there was a large white patch in it which made it appear that the upper and lower rays were greatly produced. This color in turn, after a few weeks, was replaced by the black color of the adult.

Although many notes on the coloration of fishes have been published they are scattered through the literature of every branch of ichthyology.

We offer the following partial list of the more recent papers:

1897—A. E. Verrill—Nocturnal Protective Coloration of Fishes. Am. Nat., Vol. XXXI, Feb., 1897, 99–103. Am. Journ. Sci., Vol. III, 1897, 132–136. Abstract of paper read before Am. Morph. Soc., Dec. 30, 1896.

1905—D. S. Jordan—A Guide to the Study of Fishes. New York, 1905. Vol. I, pp. 226 to 236.

1907—Raveret-Wattel—"Le Pêcheur" 18 anée No. 421, Sept. 30, 1907, p. 767. "La coloration des Poissons" gives an account of the slow color changes in fishes under the influence of great changes in color of environment.

1908—Francis Ward—Markings and colors in fish. How they protect their wearers. Scientific American, Supplement No. 1714, p. 297. New York, 1908. A few notes on protective relation of color to surroundings in Stone Loach, Pike and Gudgeon. Experiments on Pike with head in dark and body in light and vice versa. This paper was apparently published or offered for publication in "Country Life," but we have not found it in that magazine.

1909—C. Tate Regan—Proc. Zool. Soc. London, Feb. 16. 1909, p. 130. Gives notes on four species and criticises Dr. Evermann's note on species of *Bodianus* based on color in Fishes of Porto Rico, Bull. U. S. F. C., 1900 (1902).

1909—Jacob Reighard—An experimental study of warning coloration in coral reef fishes. Carnegie Inst. Pub. 103, pp. 257–325 (1909). Experiments in feeding variously colored baits to wild fishes.

1909—C. H. Townsend—13th Ann. Rep. N. Y. Zool. Soc., Jan. 1909. Observations on instantaneous changes in color among tropical fishes.

1910—C. H. Townsend—"The Century Magazine," September, 1910. Chameleons of the Sea. Notes instantaneous color changes in many tropical fishes and slower ones in some northern ones. Practically a reprint of 13th Ann. Rept. N. Y. Zool. Soc., Jan., 1909, pp. 1–28.

1910—F. B. Sumner—Adaptive color changes among fishes. Bull. Zool. Soc. N. Y., No. 42, p. 699, 1910. Color changes of *Pleuronectidæ*. Five photographs of the same fish on different bottoms.

1910—R. C. Osburn—Bull. Zool. Soc. N. Y., No. 42, p. 704, 1910. Cichlid fish at the Aquarium. These fresh-water fishes have the power of instantaneous color changes.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE NOMENCLATURE OF THE HYDROMEDUSÆ.

COMPILED BY T. D. A. COCKERELL.

The list given below is compiled from Dr. A. G. Mayer's "Medusæ of the World," in the same manner as that of the Scyphomedusæ previously published (Proc. Biol. Soc. Wash., XXIV, p. 7).* Like the other list, it has been very kindly scrutinized by Dr. Mayer, who has made a number of suggestions. Owing to the difficulties inherent in the classification of the Hydromedusæ, the list is to be considered provisional, but as it is based on Dr. Mayer's monograph, while at the same time correcting a number of nomenclatural errors, it should be serviceable. The type-species is cited after each generic name.

Order ANTHOMEDUSÆ.
Fam. SARSIIDÆ [Codonidæ].
Subf. SARSIINÆ.
Tribe Pachycordylini.
Pachycordyle Weismann.
napolitana Weismann.
Tribe Amalthæini.
Amalthæa Schmidt.
uvifera Schmidt.
Tribe Pennariini.
Pennaria Oken.
pennaria (L.).

*In the list of Scyphomedusæ are a few errors, unfortunately overlooked by me, but detected by Dr. Mayer, as follows: p. 8, read *Tesserantha connectens;* p. 9, read *Kishinouyea;* p. 10, read *Drymonema;* p. 12, read *Eupilema scapulare.* Also for Pér. & Less. read Pér. & Les.

Tribe Trichorhizini.
Trichorhiza Russell.
brunnea Russell.
Tribe Steenstrupiini.
Steenstrupia Forbes.
rubra Forbes.
Hybocodon L. Ag.
prolifer L. Ag.
Microcampana Fewkes.
conica Fewkes.
Tribe Dicodoniini.
Dicodonium Haeck.
cornutum Haeck.
Tribe Sarsiini.
Sarsia Lesson.
tubulosa Lesson.
Moerisia Bouleng.
lyonsi Bouleng.
Hydrichthys Fewkes.
mirus Fewkes.
Eucodonium Hartlaub.
brownei Hartlaub.
Ectopleura L. Ag.
dumortieri (Van Bened.).
Linrillea Mayer. [*Corynitis* McCrady, preocc.]
agassizii (McCrady).
Dipurena McCrady. [*Slabberia* Forbes, preocc.]
strangulata McCrady.

Subf. Margelopsinæ.
Margelopsis Hartlaub.
haeckelii Hartlaub.
Pelagohydra Dendy.
mirabilis Dendy.

Fam. Cladonemidæ.
Subf. Pteroneminæ.
Zanclea Gegenbaur.
costata Gegenbaur.

Zanclcopsis Hartlaub.
dichotoma (Mayer).
Pteronema Haeck.
darwinii Haeck.
Eleutheria Quatref.
dichotoma Quatref.
Mnestra Krohn.
parasites Krohn.

Subf. Cladonemin.æ.
Ctenaria Haeck.
ctenophora Haeck.
Cladonema Duj.
radiatum Duj.
Dendronema Haeck.
stylodendron Haeck.
Urashimea Kishinouye.
globosa Kishinouye.

Fam. Cytæidæ.

Subf. Pandein.e.

Tribe Protiarini.
Protiara Haeck.
tetranema (Pér. & Les.).
Heterotiara Maas.
anonyma Maas.

Tribe Stomotocini.
Stomotoca L. Ag.
dinema (Pér. & Les.).
Dissonema Haeck.
saphenella Haeck.

Tribe Pandeini.
Pandea Lesson.
conica (Quoy & Gaim.).
Conis Brandt.
mitrata Brandt.
Clavula Wright.
neglecta (Less.); syn. *gossei* Wright.

Subf. Cytæinæ.

Tribe Cytæini.
Cytæis Eschsch.
tetrastyla Eschsch.

Podocoryne Sars.
carnea Sars.
Turritopsis McCrady.
nutricula McCrady.
Modeeria Forbes.*
formosa Forbes.
Stylactis Allm.
fuciola (Sars).
Tribe Limnoreini.
Thamnostylus Haeck.
dinema Haeck.
Thamnitis Haeck.
tetrella Haeck.
Lymnorea Pér. & Les.
triedra Pér. & Les.
Tribe Bougainvilliini.
Bougainvillia Less.
bougainvillii (Less.); syn. *macloviana* Less.
Nemopsis L. Ag.
bachei L. Ag.
Rathkea Brandt.
blumenbachii (Rathke).
Chiarella Maas.
centripetalis Maas.

Subf. Proboscidactylinæ.
Tribe Bythotiarini.
Bythotiara Günth.
murrayi Günth.
Calycopsis Fewkes.
typa Fewkes.
Niobia Mayer.
dendrotentacula Mayer.
Tribe Proboscidactylini.
Proboscidactyla Brandt.
flavicirrata Brandt.
Willsia Forbes.
sellata Forbes.

* For the *Oceania* of Mayer's monograph I had proposed to use *Callitiara* Haeck, on account of the uncertainty which seemed to surround *Modeeria*. Dr. Mayer, however, advises the use of *Modeeria*.

Order LEPTOMEDUSÆ.

Fam. CANNOTIDÆ.

Subf. MELICERTINÆ.

Tetranema Haeck.

eucopium Haeck.

Laodicea Less.

cruciata (Forsk.).

Melicer'um Oken.

campanula Oken.

Melicertissa Haeck.

clavigera Haeck.

Orchistoma Haeck.

pileus (Less.); syn. *steenstrupii* Haeck.

Timoides H. B. Bigelow.

agassizii H. B. Bigelow.

Subf. POLYORCHIDINÆ.

Staurodiscus Haeck.

tetrastaurus Haeck.

Ptychogena A. Ag.

lactea A. Ag.

Polyorchis A. Ag.

penicillata (Eschsch.).

Scrippsia Torrey.

pacifica Torrey.

Spirocodon Haeck.

saltatrix Haeck.

Subf. CANNOTINÆ.

Cannota Haeck.

dodecantha Haeck.

Cuvieria Pér.

carisochroma Pér.

Dichotomia Brooks.

cannoides Brooks.

Dipleurosoma Axel Boeck.

typicum Axel Boeck.

Toxorchis Haeck.

arcuatus Haeck.

Netocertoides Mayer.

brachiatum Mayer.

Fam. Eucopiidæ.

Subf. Eucopiinæ.

Eucopella v. Lendenf.

bilabiata (Coughtrey).

Agastra Hartl.

mira Hartl.

Eucopium Haeck.

pictum (Keferst. & Ehlers.).

Obelia Pér. & Les.

marina (Slabber).*

Tiaropsis L. Ag.

multicirrata (Sars).

Acosmetira n. n.

(*Cosmetira* Hartlaub, not Forbes).

pilosella (Forbes).

Subf. Clytiinæ.

Clytia Lamx.

volubilis (Ellis & Soland.).

Phialidium Leuckart.†

hemisphaericum (Pér. & Les.)

Phialopsis Torrey.

diegensis Torrey.

Phialucium Maas.

virens (Bigelow).

Blackfordia Mayer.

manhattensis Mayer.

Pseudoclytia Mayer.

pentata Mayer.

Gastroblasta Keller.

timida Keller.

Eucheilota McCrady.

ventricularis McCrady.

Mitrocoma Haeck.

annæ Haeck.

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* Some of Slabber's names have been rejected, not being binomial, but the present one is truly so, Dr. Mayer informs me.

† For *Phialidium* I had substituted the much earlier name *Thaumantias* Eschsch., with the same type-species, but as the case is not clear, I retain *Phialidium* in the list. I thought that *Oceania* Pér. & Les., with the same type, might be available, following Agassiz. Dr. Mayer tells me that Leuckart in 1856 applied *Oceania* to what we now call *Clavula*, the *Oceania coccinea* Leuck. being *Clavula pilcata* (Forsk.). It will be necessary to reexamine the older authors to settle this case, but it seems improbable that *Phialidium* can stand.

Staurophora Brandt.
mertensii Brandt.

Subf. EUTIMINÆ.
Saphenia Eschsch.
bitentaculata (Quoy. & Gaim.).
Eutima McCrady.
mira McCrady.
Eutonina Hartlaub.
socialis Hartlaub.

Subf. EIRENINÆ.
Phortis McCrady.
gibbosa McCrady.
Irenopsis Goette.
hexanemalis Goette.
Eirene Eschsch.
viridula (Pér. & Les.).
Tima Eschsch.
flavilabris Eschsch.

Fam. ÆQUOREIDÆ.
Octocanna Haeck.
polynema Haeck.
Octogonade Zoja.
mediterranea Zoja.
Stomobrachium Brandt.
lenticulare Brandt.
Halopsis A. Ag.
ocellata A. Ag.
Æquorea Pér. & Les.
æquorea (Forsk.).
Rhacostoma L. Ag.
globulare (Modeer); syn. *atlanticum* L. Ag.
Zygocanna Haeck.
pleuronota (Pér. & Les.).
Zygocannula Haeck.
undulosa (Pér. & Les.)

Order TRACHYMEDUSÆ.

Fam. OLINDIIDÆ.

Gonionemus A. Ag.
vertens A. Ag.
Cubaia Mayer.
aphrodite Mayer.
Vallentinia Browne.
falklandica Browne.
Olindias F. Müll.
sambaquiensis F. Müll.
Olindioides Goto.
formosa Goto.

Fam. PETASIDÆ.

Petasus Haeck.
atavus Haeck.
Aglauropsis F. Müll.
agassizii F. Müll.
Craspedacusta Lank.
sowerbii Lank.
Microhydra Potts.
ryderi Potts.
Mæotias Ostroumoff.
inexspectata Ostroumoff.
Gossea L. Ag.*
corynetes (Gosse).

Fam. LIMNOCNIDIDÆ.

Limnocnida Günth.
tanganjicæ Günth.

Fam. PTYCHOGASTRIIDÆ.

Ptychogastria Allm.
polaris Allm.

Fam. TRACHYNEMIDÆ.

Subf. TRACHYNEMINÆ.

Trachynema Gegenb.
ciliatum Gegenb.
Sminthea Gegenb.
eurygaster Gegenb.

* *Gossea* Bate, in Crustacea, is of the same year (1862). Dr. Mayer has looked this up, and decides that Agassiz has priority.

Homoeonema Maas.
typicum Maas.
Tetrorchis H. B. Bigelow.
erythrogaster H. B. Bigelow.
Pantachogon Maas.
hæckelii Maas.
Halicreas Fewkes.
minimum Fewkes.
Halitrephes H. B. Bigelow.
maasi H. B. Bigelow.
Botrynema Browne.
brucei Browne.
Crossota Vanhöff.
brunnea Vanhöff.

Subf. AGLAURINÆ.
Aglaura Pér. & Les.
hemistoma Pér. & Les.
Aglantha Haeck.
digitalis (Pér. & Les.).
Amphogona Browne.
apsteini (Vanhöff.).
Stauraglaura Haeck.
tetragonima Haeck.
Persa McCrady.
incolorata McCrady.

Fam. GERYONIIDÆ.
Liriope Less.
exigua (Quoy. & Gaim.); syn.
cerasiformis Less.
Geryonia Pér. & Les.
proboscidalis (Forsk.).

Order NARCOMEDUSÆ.
Fam. SOLMARIDÆ.
Solmaris Haeck.
leucostyla (Will.)
Pegantha Haeck.
pantheon Haeck.

Fam. ÆGINIDÆ.

Ægina Eschsch.
citrea Eschsch.
Solmundella Haeck.
bitentaculata (Quoy. & Gaim.).
Hydroctena Dawydoff.
salenskii Dawydoff.
Cunoctantha Haeck.
octonaria (McCrady).
Æginura Haeck.
myosura Haeck.
Æginopsis Brandt.
laurentii Brandt.
Cunina Eschsch.
globosa Eschsch.
Solmissus Haeck.
albescens (Gegenb.).
Cunissa Haeck.
polyporpa Haeck.
Æginodiscus Haeck.
actinodiscus Haeck.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

MARINE BIOLOGICAL LABORATORY LIBRARY

A NEW CRINOID GENUS FROM THE INDIAN OCEAN.

BY AUSTIN H. CLARK.

While studying the magnificent collection of recent crinoids at the British Museum, I detected among the undetermined material representatives of several new species, one of the most interesting of which is the form described below. I urged Professor F. J. Bell, who is in charge of the echinoderm collections, to describe these new species; but, with his characteristic generosity, he suggested that, as I had become so deeply engrossed in the study of the recent crinoids, it would be more fitting that I should do it. I am therefore deeply indebted to Professor Bell for the privilege of being able to make known the following interesting new genus.

Cyclometra gen. nov.

Genotype.—*Cyclometra flavescens* sp. nov.

Systematic position.—Family Antedonidæ, subfamily Heliometrinæ.

Characters.—This new genus is closely related to *Heliometra*, which it replaces in the East Indian region; it is distinguished by having P_2 markedly shorter than P_1 instead of approximately of the same length or slightly longer, as in *Heliometra*, and by the outer segments of P_1, which are somewhat elongated instead of very short.

Cyclometra flavescens sp. nov.

Description.—Centrodorsal rounded conical.

Cirri XXVIII, 41–43, 30 mm. long; first segment short, second nearly as long as broad, the following gradually increasing in length and becoming twice as long as broad on the fourth; the next five are similar; the following gradually decrease in length, after about six more becoming about as long as broad and remaining of those proportions until the end of the cirrus. The earlier segments are slightly constricted centrally, with the

ends all around finely spinous; the short outer segments are carinate, this carination appearing convex in lateral view.

The ten arms are 130 mm. long; the 1 Br series and brachials are essentially as in *Antedon bifida*, but the distal ends of the brachials are more prominent and are finely spinous. Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of three or four oblique muscular articulations.

P_1 is very long, 17 mm. to 19 mm. in length, with from forty-two to forty-five segments, of which the first seven are broader than long, and the distal slightly elongated; P_2 is apparently similar, but shorter; P_3 bears a genital gland. The distal pinnules are exceedingly slender, 17 mm. long.

The color in spirits is yellow.

Locality.—South of Ras Sharwein, Arabia; or, northwest of Sokotra (14° 20′ N. lat., 52° 30′ E. Long.); 1200 fathoms.

Remarks.—The type of this species, which was collected by the cable repair ship *Electra*, is in the British Museum.

The following species should also be referred to this new genus:

Cyclometra clio (A. H. Clark).

Antedon clio 1907. A. H. Clark, Proc. U. S. Nat. Mus., Vol. **33**, p. 79.

Habitat.—Southwestern Japan.

Depth.—107 fathoms.

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PROCEEDINGS

OF THE

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TWO NEW SPECIES OF *EPIMYS* FROM LUZON.

BY N. HOLLISTER.

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The large series of rats of the *Epimys concolor* group, collected in Luzon by Dr. Edgar A. Mearns for the United States National Museum, is readily divisible into two lots, representing what appear to be distinct species. A small, bright colored form is decidedly nearest to *Epimys vulcani* (Mearns), described from Mindanao; and a larger, darker form appears to be a local representative of the widely ranging Malayan species *Epimys ephippium* (Jentink). No rats of this group have been previously named from Luzon, though a number of forms are known from the more southern of the Philippine Islands.

Epimys calcis sp. nov.

Type from Baguio (Limestone Hills, near Lime Kiln, at 5,000 ft.), Benguet Province, Luzon, P. I. United States National Museum No. 145,771, skin and skull, young adult ♂, molars little worn. Collected May 8, 1907, by Dr. Edgar A. Mearns. Original No. 6412.

General characters.—A small member of the *concolor-ephippium* group; pelage soft at all seasons. Nearest to *Epimys vulcani*, from which it differs in its generally paler coloration, with the sides and underparts especially lighter; and in a few slight average cranial characters.

Color.—General tone of upperparts dark russet, finely mixed with black; shading to a dark buff on sides and a pale cream on belly. The underparts of some specimens almost primrose yellow. Cheeks like sides; feet dirty white; tail brownish, slightly paler beneath. May and December skins are virtually alike. Compared with *E. vulcani*, which it most resembles, it is lighter on the sides, the light color of underparts reaching nearer to back with outsides of legs colored like belly instead of like upperparts as in *vulcani*.

Skull like that of *E. vulcani* but averaging slightly smaller, with more slender rostrum; incisive foramina smaller, shorter and narrower.

Measurements of type.—Total length, 253 mm.; tail vertebræ, 130; hind foot, 26. Skull: Condylobasal length, 29.1; zygomatic breadth, 15; palatal length, 16.4; interorbital constriction, 4.6; greatest breadth of braincase, 13.4; length of nasals, 11.0.

Remarks.—This rat is quite different from *Epimys negrinus* of Negros Island. It is much lighter colored and has a more slender skull with conspicuously smaller teeth. Curiously enough it seems much more closely related to *Epimys vulcani* of Mindanao. The series from the type locality contains nineteen specimens, collected in May and December.

Epimys querceti sp. nov.

Type from Haights-in-the Oaks, Benguet Province, Luzon, P. I. Altitude 7,000 feet. United States National Museum No. 145,833, skin and skull, adult ♂, molars considerably worn. Collected August 1, 1907, by Dr. Edgar A. Mearns. Original No. 6491.

General characters.—Nearest in appearance to true *Epimys ephippium* but averaging decidedly larger, with longer tail.

Color.—Back and sides mixed with black and cinnamon, giving a general tone of dark umber; very slightly paler on sides; outside of legs like back; feet dirty white, almost gray. Tail dark brown, usually unicolor, though a few specimens show a paler color near base below.

Skull essentially like that of *E. ephippium* but averaging slightly heavier.

Measurements of type.—Total length, 293; tail vertebræ, 160; hind foot, 28. Skull: Condylobasal length, 30.7; greatest breadth of braincase, 13.7; palatal length, 17.2; interorbital constriction, 5.2; length of nasals, 11.6; length of upper molar series, alveoli, 5.1. Average flesh measurements of ten adult specimens from the type locality and of ten adults of *Epimys ephippium* from Borneo and Sumatra, the latter in parentheses: Total length, 270.3 (258); tail vertebræ, 143.8 (130.2); hind foot, 27.4 (25.8).

Remarks.—This form is readily distinguishable from *Epimys calcis* by its larger size and darker coloration. It differs from *E. negrinus* much as does *E. calcis*, having smaller teeth and a somewhat more slender skull. It also has much coarser pelage. It is more closely related to true *E. ephippium* than are the other described Philippine forms of the group, but its large size and long tail are specific characters of sufficient value. Specimens examined, fifty-one, all from near the type locality.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

BREEDING HABITS OF THE VIVIPAROUS FISHES *GAMBUSIA HOLBROOKII* AND *HETERANDRIA FORMOSA*.

BY WILLIAM P. SEAL.

The two species under observation belong to a well-defined group of small fishes the members of which are variously known as "Top Minnows," "Mud Minnows," "Pike Minnows," "Killifishes," etc. The generic name *Gambusia* was suggested to the late Professor Poey by the common name in use in Cuba, *Gambusino*, meaning small and of no importance. The members of this genus are larger than those of *Heterandria* and have a more northerly range; the females, however, though usually twice as large as the males, rarely reach a length of two and one half inches. Until the discovery by Dr. Smith that the little fish named by him *Mistichthys* reached the adult stage at less than an inch in length *Heterandria* was about the smallest known vertebrate. According to Garman the range of *Gambusia holbrookii* is from Virginia to Alabama and is represented in the tributaries of the Mississippi and westward to Mexico by its close ally *G. patruelis*. *Heterandria formosa* is abundant in swamps and ditches coastwise from the Carolinas to Florida. It rarely exceeds an inch in length.

Gambusia was introduced into New Jersey in 1905 and from observations made by me of both it and *Heterandria* since 1906 the habits of the two are, so far as discernible, exactly similar. They are the most northerly representatives of the viviparous genera of the family Poeciliidæ. They are easily kept in small glass jars where they breed readily, eating anything that a goldfish will eat, either vegetable or animal, and as insect destroyers have no superiors.

The only recorded observation of the breeding habits of *Gambusia* is to be found in the proceedings of the U. S. National Museum for 1885, credited by the late Prof. John A. Ryder to A. A. Duly an employee of the Museum. This account appears also as a footnote to Bulletin No. 47, U. S. Nat. Mus., Fishes of North America.

Having observed the act of coition and of the extrusion of the young of both of these species a great many times every year, beginning with 1906, I am satisfied that Mr. Duly's account of it is, in many respects at least, incorrect. First, he says, "In coitus the male's head is turned in the direction of the tail of the female, the prolonged anal fin seeming to be thrust into the external opening of the ovarian duct or genital pore of the female, which lies just in advance of the anal fin." I have never witnessed anything like that, nor is it an analogical method. On the contrary the male follows incessantly and warily after the female, on the left side and to the rear, the female frequently turning and making savage dives at him causing him to turn and flee, but to return immediately and follow, watching for a moment when her attention will be distracted when he will make a sudden dash, sometimes succeeding in inserting the intromittent organ into the genital pore, but oftener, apparently, missing because of a quick turn of the female from which he flees in apparent terror. The contact is so sudden and brief that it required many observations to verify it. In these movements the male organ is thrust forward and to the right toward the female. In small jars the males are frequently killed, especially when the female is full sized, or if there are two or three females to one male. It has been noted that when catching them there appears to be a great preponderance of females, but that might be due to the fact that as the males are much smaller than the females they could more easily escape through the meshes of a net.

In the aquarium the males are continually engaged in a pursuit of the females while the females are apparently adverse to sexual dalliance and at all times unwilling participators and quick to resent the advances of the males. I have never witnessed anything to indicate a reciprocity of desire in coitus it being always a chance touch and go on the part of the males. There is never more than the one male following a female. If others approach, the male turns and drives them off.

Of course, normal action in fishes confined in aquaria is dependent on a satisfactory environment—warmth, proper food, etc. If conditions are unfavorable and they are not comfortable there will be no sexual demonstration.

Prof. Ryder says further: "The young, when born, are stated by Mr. Duly to be about $\frac{3}{8}$ of an inch in length and to be expelled in a single mass, consisting of 8 to 11 young fishes at a single effort. This mass as soon as it escapes is seen to be composed of the infant *Gambusia*, which at once separate and move away. No membrane seemed to be expelled together with the mass of young, so that it is probable that in this species, as in *Anableps* and the *Embiotocidæ* the foetuses rupture the follicles in which they developed a short time before birth."

One has only to open a gravid female to see that Mr. Duly's account of the birth of *Gambusia* would be a physical impossibility. The ova of a full sized *Gambusia* are, when fully developed, about an eighth of an inch in diameter, transparent and non-adhesive. Each one is held, apparently, by a thread of membrane to a central nucleus the character of which could only be determined by microscopic examination. The young fish can be seen fully formed, their eyes moving as they turn around in the egg. They are expelled one at a time and the ejection of each fish is so rapid that they appear as though shot out with some force. This, however, might be due to the bursting of the follicle and the uncoiling of the fish as it is released from restraint. When they first appear they are still in a somewhat curved form but they quickly straighten out and swim into hiding. The follicles are undoubtedly ruptured at the moment of extrusion, whether inside or out, I never succeeded in observing, but it appears the more probable that it is inside. The young fish are already pigmented and altogether unlike the generality of embryo fishes. Oviparous species, when hatched, having an umbilical sac and being for some time unable to feed and quite helpless. They are also transparent and very delicate, while the young of the viviparous fishes are apparently, except in size and the development of the male sexual organ, as fully developed as the adult. I would say that $\frac{7}{16}$ to $\frac{1}{2}$ inch is nearer the size of the fish when born than $\frac{3}{8}$ inch, although the size, no doubt, varies with the size of the female. The intervals between the extrusions vary from several

minutes to as many hours. The number given off at one time varies also. After the extrusion of such young as have been developed, there is a period of rest of several days during which another lot is developed, a limited number of eggs only being fertilized at each sexual contact. I can not do better than to copy a series of notes taken from my observations.

1906. July 14 to 16. *Heterandria* female extruded 16 young. Some appeared on 14th, some on 15th, and some on 16th. Last previous delivery from same female was seven young. Three prior deliveries at intervals not noted, but not greater than the last mentioned one, resulted in the delivery of five, seven, and seven, respectively. It is impossible to say whether those numbers represent accurately the respective deliveries, as some were born at night and at other times when they were not under observation, and some may have been eaten.

July 21st (five days later). Found 9 young and on 23d found 2 more. Saw the female eat one of these. This may only occur when other animal food is wholly absent, or in the case of such young as are imperfect—deficient in vitality or deformed in some way. On the other hand there seems to be a universal tendency on the part of the females of all nest building fishes to devour their eggs and young. This may also be characteristic of females of viviparous species. The writer has recorded the action of male sticklebacks in frightening their young by darting at them as though to devour them, causing them to rush to cover among the plants. This is undoubtedly a continuance of the protective habit from the eggs to the young until they are capable of self protection.

August 1st (8 days interval), found 4 young. August 2d, found 12; August 4th and 5th, 2 more, making 18 in all.

August 10th–11th (5 days interval), found 4 more.

August 18th (7 days interval), found 10.

These fish grow and develop very rapidly if properly fed.

I had paired two that had been hatched early in May. On July 27th I found one young in the jar but at first supposed it must have been in the jar hiding among the plants when the breeders were introduced, as I could not conceive of two generations of fish in one season, it being so contrary to the habits of fishes in general. But on August 18th I found 6 young about which there could be no doubt.

August 26–27, found 5 more.

September 3d to 10th found several more. Also found several young with a pair hatched early in July.

It is thus positively demonstrated, not only that there can be two or more generations of these species born in a summer, but also a second generation in less than three months, so that although the fecundity is not so great as with oviparous species there is more rapid reproduction as well as protection both through the egg stage and by reason of the greater development and activity of the young when first hatched, the danger period with the others. This will account for the great numbers of these species where they abound, notwithstanding they are the prey of all the larger species.

I have repeated these observations several times with both species with the same general results—any difference being in the varying numbers produced, which, however, were a close approximation.

Notwithstanding that these two species live together apparently in perfect harmony there is sexually an apparently rigid racial antipathy. I have succeeded a number of times in hybridizing a male *Gambusia* with a female *Heterandria*, but not the reverse, probably because of the very small size of the males of the latter species. The offspring of these crosses had the appearance of *Gambusia*, none of the conspicuous markings of *Heterandria* appearing on any of them. They were fertile and reproduced, but the young also had the appearance of *Gambusia*. This fact would have caused me to suspect a mistake somewhere in the course of the experiment if I had heard or read of it, but I know that there was no possibility of error because they were isolated in small jars with no change or interference. If it were not for such an antipathy, which appears to be confined to the females, the species would soon be intermixed.

The attitude of the female *Heterandria* toward the male *Gambusia* was even more hostile and savage than that of females of the same species. She would not only repulse him savagely but at times would follow him biting him viciously until he succeeded in hiding from her. Notwithstanding these vicious rebuffs he would soon be back, following persistently at the left and rear, rushing and retreating all through the hours of daylight at least.

The female *Heterandria* is at least double the bulk of a male *Gambusia*, though not of much greater length, and much more than a match for him. In the attacks of the females of either species they seem to endeavor to bite the long slender organ of the male, which is no doubt the most vulnerable point.

This pair were together for two summers and the production of young throughout was approximately the same as that of the pair of *Heterandria* previously mentioned.

Notwithstanding the viciousness displayed by the females with apparently no sign of yielding, there may be a cessation of hostilities during the darkness of night as they appear much more quiet in a dim light. There may be times also when there is a yielding from sexual impulse, but I have never been able to observe it. This is probable and would be analogous to the conduct of higher animals.

The male generative organ, as may be seen by the accompanying figures, is extremely long in proportion, being almost a third as long as the fish. It can be thrown completely in a circle close against the body of the fish as though working on a pivot.

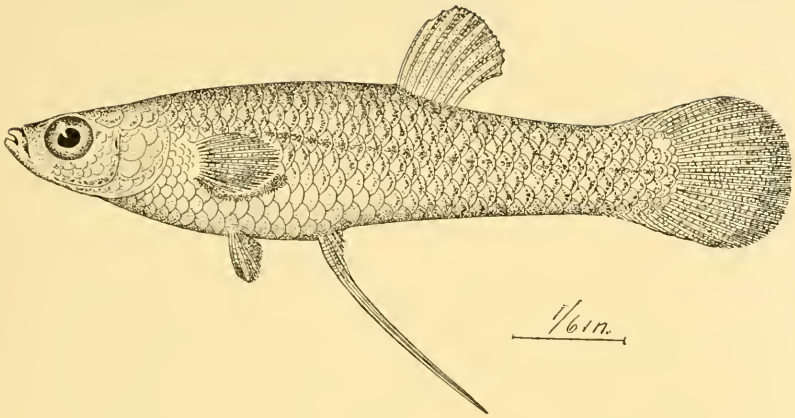

Fig. 1.

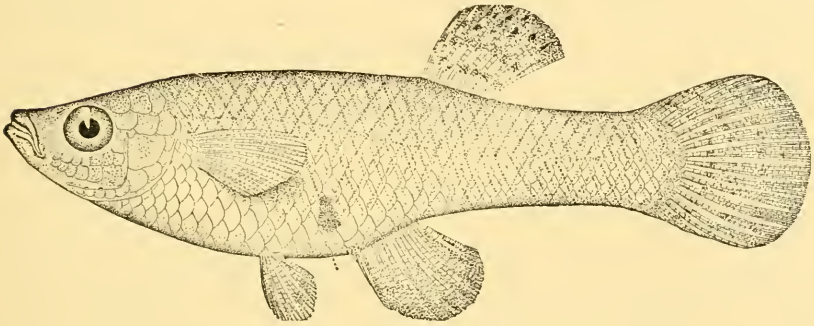

Fig. 2.

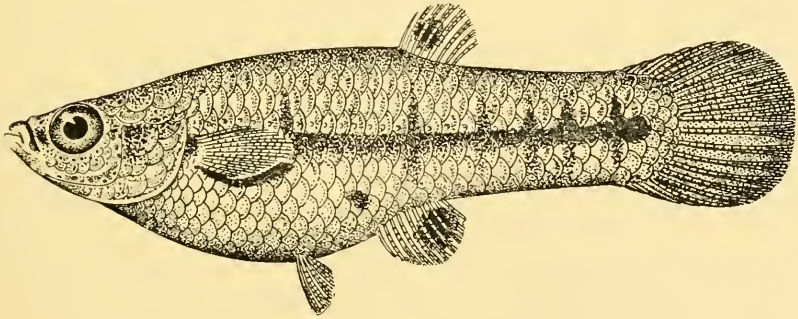

Fig. 3.

Fig. 1. *Gambusia holbrookii*, male.
Fig. 2. *Gambusia holbrookii*, female.
Fig. 3. *Heterandria formosa*, female.
(Much enlarged.)

Vol. XXIV, pp. 97–100 May 15, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

GENERAL NOTES.

A NEW NAME FOR *SOREX MACRURUS* BATCHELDER.

In 1896 I described in these Proceedings (Vol. X, pp. 133–134, December 8, 1896) a new species of shrew from the Adirondack Mountains, New York, giving it the name of *Sorex macrurus*. Through the kindness of Mr. Gerrit S. Miller, Jr., I recently have learned that this use of the name is invalidated, owing to the fact that it was applied in 1822 by J. G. C. Lehmann (Observationes Zoologicae praesertim in Faunam Hamburgensem. Pugillus Primus.) to the common European water shrew, *Neomys fodiens* (Schreber). Lehmann's type locality was Sachsenwald, near Friedrichsruh, Schleswig-Holstein, Germany.

It therefore becomes necessary to give another name to the Adirondack shrew, and I propose to call it *Sorex dispar*.

—*Charles Foster Batchelder.*

NOTE ON THE OCCURRENCE OF THE WHALE SHARK, *RHINODON TYPICUS*, IN THE PHILIPPINE ISLANDS.

In the issue of the *Philippine Free Press* for September 10, 1910, there is published a photograph, with brief description, of a marine monster from Negros Occidental. The photograph was submitted in competition and received the prize for the current week. The newspaper states that two other photographs of the same subject were sent in by other competitors, but the one selected was the best. Throughout the article the animal is referred to as a whale, but the photograph clearly indicates a whale shark, *Rhinodon typicus*.

The creature was 6 meters long, and was caught in a fish trap near Bacolod, Island of Negros, on September 4, 1910.

This species, so far as known, has not heretofore been reported from the Philippine Archipelago, although its distribution is world-wide.* Outside of the Indian Seas it occurs only as a rare straggler. There have been several records from the Dutch East Indies, so that the capture of a specimen in the Philippines is not unexpected although none the less interesting.

—*Hugh M. Smith.*

* See Bean's "The History of the Whale Shark," Smithsonian Miscellaneous Collections, vol. XLVIII, 1905.

OWEN'S RECENT ENCRINITE IDENTIFIED.

In 1862 Sir Richard Owen wrote (Ann. and Mag. Nat. Hist. (3), vol. 9,* p. 486) "I learn from a correspondent at Melbourne, Mr. J. S. Poore, that during his visit to King George's Sound, Western Australia, he there dredged up from 8 fathoms a living Encrinite. The stem, which was attached to a stone, was about 6 inches long; the arms about 1½ inch, of a beautiful rose-colour or pink, fading to white." Dr. P. H. Carpenter, commenting upon this, says (*Challenger* Reports, vol. 11, Zoology, p. 428) "This may perhaps have been a Pentacrinoid larva, but if so, it was of most unusual size." It seems most probable, however, that this was really a small Umbellularian; one of Kölliker's figures of the young of *Umbellularia carpenteri*, taken by the *Challenger* in the seas southwest of Australia, shows an animal sufficiently like a crinoid to deceive even a fairly skilled zoologist, and of the size described by Owen. The color as given is certainly suggestive of an Umbellularian, and, moreover, does not occur in any of the small stalked crinoids, nor in any pentacrinoid larvæ.

—*Austin H. Clark.*

NOTE ON *AGARNA CARINATA* SCHIŒDTE AND MEINERT.

Recently in referring to Haller's paper "Uebér einige neue Cymothoïnen,"* my attention was called to a new species described therein as *Livoneca cumulus* from Guadeloupe. The species described later by Schiœdte and Meinert† as *Agarna carinata* from the West Indies is undoubtedly identical with this form. The correct name for the species is therefore *Agarna cumulus* (Haller).

—*Harriet Richardson.*

SCIURUS POLIOPUS LYON CHANGED TO *SCIURUS CONIPUS*.

Sciurus poliopus Lyon (Proc. U. S. Nat. Mus., vol. 40, p. 88, April 25, 1911) applied to a gray-footed plantain-squirrel from southeastern Borneo is preoccupied by *Sciurus variegatus poliopus* Fitzinger (Sitz. k. k. Akad. wiss. Wien, math.-naturw. Cl. vol. 45, Abth. 1, p. 478, March, 1867), applied to a Mexican squirrel. The former may be called *Sciurus conipus*.

—*Marcus Ward Lyon, Jr.*

CAPTURE OF *SOREX DISPAR* IN WEST VIRGINIA.

This rare shrew, originally described as *Sorex macrurus* and since renamed *dispar*,‡ has previously been known only from 10 specimens taken in the Adirondack and Catskill Mountains of New York. The capture of a specimen in West Virginia is, therefore, quite unexpected and of great interest. The specimen referred to I trapped on July 24, 1909, on the cool north slope of Winding Gulf, about four miles southwest of

* Archiv-fur Natur-Geschichte, 1880, 46th year, Vol. 1, pp. 383–386, 391, figs. 13–15.

† Naturhistorisk Tidsskrift (3), Vol. XIV, 1883–84, pp. 328–334, pl. XIII, figs. 1–6,

‡ See page 97, this volume.

Pemberton, Raleigh County, at an altitude of about 2,200 feet. The steep slope of the cañon is heavily forested with hemlock and a variety of deciduous trees, with a dense undergrowth of rhododendron, striped maple (*Acer pennsylvanicum*), purple-flowering raspberry (*Rubacer odoratum*) and other shrubs. The soil is wet and spongy, with a carpet of mosses and ferns growing among rocks and bowlders. On this cool, wet, Transition Zone hillside I found shrews very abundant, taking in one night 9 *Blarina brevicauda*, 3 *Sorex fumeus* and 1 *Sorex dispar*. The latter appears to be in every way identical with specimens taken by Dr. Mearns in the Catskill Mts., New York. It is an adult male and measured in the flesh: total length, 131 mm.; tail vertebrae, 62 mm.; hind foot, 14 mm. —*Arthur H. Howell.*

Vol. XXIV, pp. 101–102 May 15, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NEW NAMES FOR TWO SUBSPECIES OF *PEROMYSCUS MANICULATUS* (WAGNER).

BY EDGAR A. MEARNS.

Mr. Gerrit S. Miller, Jr., has drawn my attention to the fact that the names applied by me to two forms of the genus *Peromyscus*, defined in 1890, were preoccupied, and are therefore not available.

The name *Hesperomys leucopus arcticus* Mearns (1890)* must be considered as preoccupied by "[*Hesperomys*] *arcticus*, Sauss." of Coues 1877,† in accordance with "opinion 4," rendered by the international commission on zoological nomenclature,‡ which affirms that "manuscript names acquire standing in nomenclature when printed in connection with the provisions of Art. 25,§ and the question as to their validity is not influenced by the fact whether such names are accepted or rejected by the author responsible for their publication." In this case it is evident that the author did not intend to set up *arcticus* as the name of a valid form, as, indeed, he expressly stated that he considered it to show not the slightest departure from the ordinary form of *leucopus*. The name *arcticus* can not be regarded as a *nomen nudum*, as Coues gave a complete history, with no less than eight measurements of specimen No. 3924. Moreover, as the animal from Labrador to which Coues attached the name *arcticus*, in 1877, is a synonym of *Hesperomys maniculatus* Wagner, 1845, the name *arcticus* disappears from nomenclature‖ and can not be used for the different form from Fort Simpson, Mackenzie, Canada, which I described, in 1890, under the name *Hesperomys leucopus arcticus*; for the latter I now propose the name *borealis*.

* Bull. Am. Mus. Nat. Hist., N. Y. II, 1890, p. 285.

† Monogr. N. Am. Rodentia, 1877, p. 67 (in text) and p. 61 (where the name is misprinted *articus*), table XI, line 1 (Labrador).

‡ Opinions rendered by the International Commission on Zoological Nomenclature. Opinions 1 to 25, publication No. 1938 of the Smithsonian Institution, July, 1910.

§ International Code of Zoological Nomenclature, 1905, p. 23.

‖ "[*Hesperomys*] *bairdii* Sauss.", which Coues mentions in the same connection, also from Labrador, has the same status as *arcticus*; it being a young specimen of Wagner's *maniculatus* (Not *Mus bairdii* Hoy and Kennicott, 1856).

Baird's *Hesperomys sonoriensis nebrascensis** is a *nomen nudum*, though it is evident from a comparison of the text and synonymy on pages 462 and 474 of his Mammals of North America that he at first intended to describe this race as a form of *sonoriensis*, but that, later, he changed his opinion respecting its validity or possibly omitted it through oversight; but Coues repeated the name†, and referred to specimens from Deer Creek, Nebraska, giving measurements and a critical remark on coloration. The name will therefore have to date from Coues. This Nebraskan form was redescribed by Osgood as *Peromyscus luteus*.‡

The *Hesperomys leucopus nebrascensis* Mearns§, from Calf Creek, Custer County, Montana, is subspecifically distinct from *Hesperomys sonoriensis* var. *nebrascensis* Coues, from Deer Creek, Nebraska, and as it must receive a new name, I propose *osgoodi* as a subspecific appellation.

The synonymy of the three forms involved stands as follows:

Peromyscus maniculatus borealis, new name.
ARCTIC DEER MOUSE.

Hesperomys leucopus arcticus Mearns, Bull. Am. Mus. Nat. Hist. N. Y., II, 1890, p. 285 (not of Coues). Fort Simpson, Hudson's Bay Territory, September 7th, R. Kennicott.

Peromyscus maniculatus arcticus Osgood, N. Am. Fauna, No. 19, 1900, p. 33.

Peromyscus maniculatus nebrascensis (Coues).
NEBRASKA DEER MOUSE.

Hesperomys sonoriensis var. *nebrascensis* Baird, Mamm. N. Am., 1857, p. 462 (*nomen nudum*).

Hesperomys sonoriensis var. *nebrascensis* Coues, Monogr. N. Am. Rodentia, 1877, p. 79, synonymy under *Hesperomys leucopus sonoriensis*, p. 28 (critical remark on coloration), p. 80 (mentions specimens from Deer Creek, Nebraska).

Peromyscus nebrascensis of authors (not of Mearns).

Peromyscus luteus Osgood, Proc. Biol. Soc. Washington, XVIII, 1905, p. 78 (Kennedy, Nebraska).

Peromyscus maniculatus luteus Osgood, N. Am. Fauna, No. 28, 1909, p. 77.

Peromyscus maniculatus osgoodi, new name.
BLACK-EARED DEER MOUSE.

Hesperomys leucopus nebrascensis Mearns, Bull. Am. Mus. Nat. Hist., N. Y. 1890, p. 285 (not *Hesperomys sonoriensis* var. *nebrascensis* Coues, 1877). Calf Creek, Custer County, Montana.

Peromyscus texanus nebrascensis Allen, Bull. Am. Mus. Nat. Hist., N. Y., VIII, 1896, p. 251 (part).

Peromyscus maniculatus nebrascensis Osgood, N. Am. Fauna, No. 28, 1909, p. 75 (based on Mearns).

* Mamm. N. Am., 1857, p. 462.

† Monogr. N. Am. Rodentia, 1877, pp. 28, 79 and 80.

‡ Proc. Biol. Soc. Washington, 1905, p. 78 (Kennedy, Nebraska).

§ Bull. Am. Mus. Nat. Hist., N. Y., 1890, p. 285.

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PROCEEDINGS
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NOTES ON GENERA OF PANICEAE. IV.*

BY AGNES CHASE.

The work upon the genera of *Paniceae* as originally outlined contemplated a consideration by groups. It was the intention of the writer to prepare as a final paper a synopsis of the entire work, in a sequence representing, so far as possible in a lineal series, the natural relationship of the genera investigated. This synopsis with special reference to American genera together with notes on the North American genera are offered in a preliminary way at this time at the request of Mr. G. V. Nash, of the New York Botanical Garden, who wishes to cite the references in his forthcoming treatment of the tribe *Paniceae* in the North American Flora.

PANICEÆ.

Spikelets ideally 2-flowered, the terminal floret perfect, the lower staminate or neuter (perfect in *Isachne* and *Dissochondrus*), its glume (the sterile lemma) unlike the flowering glume (the fertile lemma) in form and texture and simulating a third empty glume, a membranaceous or hyaline sterile palea (indurated at maturity in *Ixophorus* and in a few species of *Panicum*) present or wanting, the spikelet or at least the fruit (the fertile floret) dorsally compressed (laterally in *Lithachne*); fertile lemma and palea alike in texture, indurated, or at least firmer than the glumes and sterile lemma, firmly clasped together (open at the summit in *Leptocoryphium* and *Hymenachne*) inclosing the free grain (in the cultivated *Pennisetum americanum* the enlarged grain forcing open the lemma and palea), awnless (sometimes mucronate, acuminate-pointed or, in *Coridochloa*, *Alloteropsis*, and species of *Eriochloa*, even short-awned), the nerves obsolete (present in *Reimarochloa* and *Acritochaete*).

*Notes on Genera of Paniceae I appeared in Proc. Biol. Soc. Wash. 19 : 183–192. 1906; same II, op. cit. 21 : 1–10. 1908; same III, op. cit. 21 : 175–188. 1908.

In the following synopsis and diagnoses this ideal spikelet is always in mind, the same name being used for corresponding parts, even when the first glume is wanting as in most species of *Paspalum* or when both glumes are wanting as in *Reimarochloa* and in a few species of *Paspalum*, the scale which appears to be a glume in the latter case, being the sterile lemma.

The type species of each of the genera here recognized, except *Thrasya*, *Odontelytrum* and *Dissochondrus*, and of most of the generic names referred to synonymy, is represented in the National Herbarium by specimens or in a few cases by spikelets contributed from type specimens.

Synoptical Key.

Spikelets all alike (the lower of each pair aborted in *Echinolaena*).
Spikelets neither sunken in the cavities of a spongy rachis, nor surrounded by an indurated leaf-sheath nor involucre-form bracts.
Spikelets not subtended nor surrounded by bristles (sterile branchlets), (axis of branchlet extending beyond the base of the uppermost spikelet as a point or bristle in *Panicum*, subgenus *Paurochaetium*).
Fruit cartilaginous-indurated, not rigid, papillose, usually dark colored, the lemma with more or less prominent, white hyaline margins not inrolled. (Fruit not rigid in *Hymenachne*, *Reimarochloa* and in a few species of other genera, but texture and margin not as above.)
Spikelets awnless.
Fruit open at hyaline summit . . . . . 1. *Leptocoryphium*.
Fruit not open at summit.
Lemma boat-shaped, hyaline margins narrow . . . . . 2. *Anthaenantia*.
Lemma convex with broad hyaline margin.
Fruit lanceolate-acuminate; second glume and sterile lemma unusually long-silky . . . . . 3. *Valota*.
Fruit elliptic, pubescence short or none.
Inflorescence of slender racemes, digitately or subdigitately arranged . . . . . 4. *Syntherisma*.
Inflorescence a capillary panicle . . . . 5. *Leptoloma*.
Spikelets with slender awns.
Second glume reduced to a minute scale; sterile lemma with a straight awn . . . . . 6. *Chloridion*.
Second glume and sterile lemma with flexuous or tangled awns . . . . . 7. *Acritochaete*.
Fruit indurated, rigid (or if thin, not hyaline-margined).
Alternate spikelets facing in opposite ways, that is the first glume alternately extrorse and introrse; inflorescence a solitary, unilateral raceme, the margins of the concave rachis partially embracing the subsessile spikelets . . . . . 8. *Thrasya*.

Alternate spikelets not facing in opposite ways (or if so the lower of the pair aborted).
Spikelets (or the primary one of a pair) placed with the back of the fruit turned away from the rachis, usually solitary.
First glume as long as the spikelet or nearly so.
Spikelets in pairs, the secondary usually aborted, sometimes wanting, strongly tuberculate-hispid or uncinate at maturity, laterally compressed, in unilateral racemes . . . . . 9. *Echinolaena.*
Spikelets solitary, not tuberculate nor uncinate.
Inflorescence a single spike-like raceme; spikelets swollen on the side toward the axis and fitting into alternate hollows . . . . . 10. *Mesosetum.*
Inflorescence a narrow panicle; spikelets swollen on the side away from the rachis or at least more convex on that side . . . . . 11. *Leucophrys.*
First glume obsolete or not over $\frac{1}{4}$ the length of the spikelet.
First glume and rachilla joint forming a swollen ring-like callus below the spikelet, the glume reduced to an adnate sheath of the rachilla joint; fruit mucronate or shortly awn-pointed . . 12. *Eriochloa.*
First glume present or wanting but no ring-like callus below the spikelet.
First glume present; racemes racemose along the main axis . . . . . 13. *Brachiaria.*
First glume wanting; racemes digitate or subdigitate . . . . . 14. *Axonopus.*
Spikelets placed with the back of the fruit turned toward the rachis of the spike-like racemes, or pedicellate in panicles.
Fruit long-acuminate, scarcely indurated, both glumes wanting; spikelets sessile, solitary in spike-like racemes, these reflexed or verticillate at maturity 15. *Reimarochloa.*
Fruit not long-acuminate, indurated (if but slightly indurated, both glumes present and inflorescence paniculate).
First glume typically wanting; spikelets plano-convex, subsessile in spike-like racemes . 16. *Paspalum.*
First glume present; spikelets usually in panicles.
Neither glumes nor lemmas awned.
Spikelet with a single fertile floret.
Second glume and sterile lemma not indurated, like the first glume in texture.
Glumes not equal nor entirely enclosing the rest of the spikelet.

Fruit chartaceous-indurated the palea enclosed (rarely the tip free).
Second glume not inflated-saccate.
Culms not woody nor bamboo like.
Fertile lemma neither with lateral appendages nor excavations at base, the inrolled margins clasping the palea; inflorescence typically paniculate. 17. *Panicum.*
Fertile lemma either with lateral appendages or excavations at base, the margins usually not inrolled; first glume large; blades usually contracted into a petiole-like base . . 18. *Ichnanthus.*
Culms usually woody, bamboo-like; spikelets globose, large, the glumes and sterile lemma papery; fruit bony-indurated, a downy tuft at the apex . . . . . 19. *Lasiacis.*
Second glume inflated-saccate, this and the sterile lemma much exceeding the stipitate fruit . . . . 20. *Sacciolepis.*
Fruit membranaceous, the palea not inclosed above; spikelets lanceolate, subsessile in usually spike-like panicles . . . . . 21. *Hymenachne.*
Glumes equal, enclosing the rest of the dorsally compressed spikelet; margins of the fertile lemma flat . . . 22. *Homolepis.*
Second glume and sterile lemma leathery-indurated; spikelets stipitate . . 23. *Scutachne.*
Spikelets typically with two fertile florets.
Florets alike in form and texture; panicle compound . . . . . 24. *Isachne.*
Florets unlike, the lower lanceolate, exceeding the upper; panicle racemose. 25. *Heteranthoecia.*
Glumes or lemmas or both awned, or if short-pointed only, the summit of fertile palea not enclosed.
Inflorescence of unilateral racemes along a common axis, never digitate; glumes 2-lobed (rarely entire) awned from between the lobes; fruit indurated, the palea enclosed at the summit . . . . . 26. *Oplismenus.*

Inflorescence paniculate or of slender subsimple racemes, these digitate.
Spikelets never silky-pubescent, nor ciliate-margined, often scabrous or hispid.
Spikelets ovate, not having a callus-like base . . . . . 27. *Echinochloa.*
Spikelets lanceolate, with a long callus-like base below the long-awned glumes. 28. *Chaetium.*
Spikelets silky pubescent or with a conspicuously ciliate margin; fruit subindurated.
Second glume and sterile lemma 2-lobed, a slender awn from between the lobes; fruit awnless; first glume remote; inflorescence paniculate . . . 29. *Tricholaena.*
Second glume and sterile lemma not lobed; fruit awned; first glume not remote; inflorescence of digitately arranged, subsimple racemes.
Sterile lemma and glumes papery, not at all indurated; fruit stipitate. 30. *Coridochloa.*
Sterile lemma subindurated similar to the fertile lemma . . . . . 31. *Alloteropsis.*
Spikelets subtended or surrounded by 1 to many bristles or spines (sterile branchlets), these distinct or more or less connate at base, forming a pseudo-involucre.
Spikelets deciduous, bristles persistent.
Spikelet with lower floret as well as the upper perfect and with indurated lemma and palea. . . . . 34. *Dissochondrus.*
Spikelet with upper floret only perfect.
Sterile palea at maturity becoming cartilaginous and winged, much exceeding the spikelet in width; spikelets secund along the branches of a simple panicle, each subtended by a single viscid bristle. 35. *Ixophorus.*
Sterile palea not enlarged at maturity.
Second glume and sterile lemma very broad, many-nerved, the glume saccate, auriculate, the lemma lyre-shaped, indurated on the margins; the spikelet subtended by a single flexuous bristle . 32. *Setariopsis.*
Second glume and sterile lemma not many-nerved, saccate, auriculate nor lyre-shaped; subtending bristles 1 to many . . . . . 33. *Chaetochloa.*
Bristles falling with the spikelets at maturity (in the cultivated *Pennisetum americanum* the globose grain falls from the usually persistent spikelet, with or without the lemma and palea attached).

Articulation below the spikelet-bearing branchlets.
A single bristle produced beyond the solitary spikelets.
First glume present; second glume and sterile lemma acuminate; fruit not acuminate . . 36. *Chamaeraphis.*
First glume usually obsolete, second glume minute, sterile lemma and fruit long-acuminate . 37. *Paratheria.*
Bristles numerous below each spikelet or cluster of spikelets.
Bristles not united at base, usually slender, often plumose . . . . . 38. *Pennisetum.*
Bristles more or less united at base into a bur-like pseudo-involucre . . . . . 39. *Cenchrus.*
Articulation at the junction of the primary branches with the main axis . . . . . 40. *Plagiosetum.*
Spikelets either sunken in the cavities of a corky axis or surrounded by a sheath or by involucre-form bracts.
Spikelets sunken in the cavities of the flattened corky axis, this disarticulating at maturity with the spikelets attached. 41. *Stenotaphrum.*
Spikelets not sunken in a corky axis.
Spikelets in small spikes, these surrounded by rigid sheaths. 42. *Xerochloa.*
Spikelets solitary, subtended by two glume-like bracts, these placed cross-wise to the spikelet* . . . . . 43. *Odontelytrum.*
Spikelets not all alike.
Plants monoecious or polygamous, that is with the different kinds of spikelets on one plant.
Spikelets all perfect, but those of the aerial panicle not perfecting grains; the fruitful spikelets cleistogamous, borne on subterranean branches . . . . . 44. *Amphicarpon.*
Spikelets not all perfect.
Spikelets hermaphrodite and sterile.
Spikes several, crowded on a leaf-like axis . . 45. *Phyllorachis.*
Spike solitary . . . . . 46. *Thuarea.*
Spikelets unisexual.
Inflorescence paniculate; fruit bony-indurated.
Panicles terminal on culms or leafy branches, pistillate spikelets above, staminate spikelets below, in same panicle . . . . . 47. *Olyra.*
Panicles all axillary or axillary and terminal; the terminal when present wholly staminate.
Fruit laterally compressed, conspicuously gibbous on upper dorsum . . . . . 48. *Lithachne.*
Fruit dorsally compressed, lanceolate . 49. *Raddia.*
Inflorescence of spike-like racemes.
Raceme solitary; spikelets geminate, a pistillate and a staminate forming a pair . . . . . 50. *Diandrolyra.*

* Taken from Hackel's description. We have not yet seen the plant.

Racemes 2, digitate, one pistillate, the other staminate, the spikelets solitary . . . . . 51. *Mniochloa.*
Plants dioecious . . . . . 52. *Spinifex.*

1. Genus LEPTOCORYPHIUM Nees.*

Leptocoryphium Nees, Agrost. Bras. 83. 1829. Two species are included, *L. lanatum* Nees, based on *Paspalum lanatum* H. B. K., and *L. molle* Nees, the first named being here taken as the type of the genus.

2. Genus ANTHAENANTIA Beauv.

Anthaenantia Beauv. Ess. Agrost. 48. pl. 10. f. 7. 1812. Based on a single species, *Phalaris villosa* Michx. This name is spelled *Anthenantia* † by Robert Brown (in Flinders, Voy. App. 2: [3]582. 1814) and *Athenantia* † by Kunth (Mem. Mus. Paris 2: 71. 1815).

Aulaxanthus Ell. Bot. S. C. & Ga. 1: 102. 1816. Two species, *A. ciliatus* Ell. and *A. rufus* Ell., the first named of which is here taken as the type, are included. The type of *A. ciliatus*, in Elliott's herbarium, is *Anthaenantia villosa* (Michx.) Benth. Elliott refers "*Phalaris villosa?* Michx." to *A. ciliatus*. With the later fascicles of Elliott's work an illustration of *A. rufus* (pl. 6. f. 1), was given, but since this was not published until 1821 the first species published under the genus is taken as the type.

Aulaxia Nutt. Gen. Pl. 1: 47. 1818. This is based on *Aulaxanthus* Ell., Elliott's description, slightly altered, being used and his species cited. Steudel (Nom. Bot. ed. 2. 1: 171. 1840) spells the name *Aulaxis*.

3. Genus VALOTA Adans.

Valota Adans. Fam. Pl. 2: 495. 1763. This genus is established by a reference to "Sloan. t. 14. f. 2." This figure identifies the genus with *Andropogon insulare* L. (Syst. Nat. ed. 10. 2: 1304. 1759). The type of the latter in the Linnaean Herbarium is from Jamaica, sent by Browne. After his diagnosis Linnaeus cites "Sloan. jam. t. 14. f. 2." Steudel (Nom. Bot. ed. 2. 2: 744. 1841) spells the name *Vallota*.

Acicarpa Raddi, Agrost. Bras. 31. pl. 1. f. 4. 1823. This is based on a single species, *A. sacchariflora* Raddi, the figure and description of which identify it with *Valota insularis*. Raddi also cites "*Sloan.* H. jam. I. p. 43. t. 14. fig. 2)."

Trichachne Nees, Agrost. Bras. 85. 1829. Six species are included in the genus, *T. insularis* Nees which is taken as the type, based on *Andropogon insulare* L., *T. sacchariflora* (Raddi) Nees, which we now know to

* The group containing the first five genera here given was earlier discussed and the fruit of the type species figured (Proc. Biol. Soc. Wash. 19: 183–192. 1906). Only a summary of that discussion is here given, with such additional knowledge as has been gained.

† These misspellings or changes of spelling are here given only because these names have found their way into synonymy, hence must be accounted for.

be synonymous with the first, and four new ones, *T. recalva*, *T. tenuis*, *T. velutina* and *T. ferruginea*.

Since the notes on *Valota* were published* Prof. A. S. Hitchcock has examined the types of *T. tenuis* and *T. recalva* in Nees' herbarium at Munich, and duplicate types of *T. ferruginea* and *T. velutina* in the Trinius Herbarium. *Trichachne recalva* is seen to be allied to *V. Pittieri* (Hack.) Chase, while *T. ferruginea* and *T. velutina* approach *Syntherisma* through *S. adusta*. *Trichachne tenuis* Nees, upon which Kunth based *Panicum tenerrimum* (Rév. Gram. 1:39. 1829) is most nearly allied to *V. insularis*, but has much smaller spikelets with less copious and shorter hairs. None of these species are the one referred to† as represented in American herbaria by Nealley's Texas collections and passing under the name of *Panicum tenerrimum* Kunth. This very distinct species was collected in the summer of 1910 by Prof. A. S. Hitchcock, and is described below:

Valota Hitchcockii sp. nov.

Plants perennial, in dense clumps; culms erect, very slender, 30 to 50 cm. high, sparingly branching from the lower nodes, glabrous, usually very leafy, the lower nodes ascending-villous, the upper glabrous; sheaths about as long as the internodes or overlapping, the lower silky-villous, the middle and upper with a few, scattered, delicate hairs or glabrous or silky-ciliate only; ligule membranaceous, scarcely 0.5 mm. long, continued as a brown scarious margin down the sheath; blades ascending or erect, flat, 2 to 4.5 cm. long, 2 to 2.5 mm. wide, scarcely narrowed to the base, glabrous on the lower surface, minutely puberulent or glabrous on the upper, usually with a few long hairs near the base, and with a thin, white, cartilaginous margin; panicles consisting of few to several ascending racemes rather distant along a slender, glabrous axis, the rachises slender, 3-angled, the spikelets mostly in pairs, one short-pediceled, the other on a pedicel about as long as the lower spikelet, thus forming slender racemes, the spikelets scarcely imbricated; spikelets whitish or purplish, 2.5 to nearly 3 mm. long, 0.7 mm. wide, or with the hairs expanded about 1.2 mm. wide; first glume less than $\frac{1}{3}$ the length of the spikelet, obtuse, glabrous; second glume and sterile lemma equal, strongly 7- to 9-nerved, the internerves and margins densely silky hairy, the hairs at first appressed, at maturity spreading and matted, the spikelets often matted together by the tangled hairs; fruit 2.1 to 2.2 mm. long, 0.6 mm. wide, abruptly short-acuminate, brown, the broad, white, hyaline margins of the lemma nearly covering the palea except at the base.

Type collected June 24, 1910, on dry prairie soil, San Antonio, Texas, by A. S. Hitchcock (no. 5329).

Valota Hitchcockii is most nearly related to *V. saccharata* (Buckl.) Chase, from which it is distinguished by its lower stature, short blades, short racemes of smaller spikelets, the sterile lemma densely hairy on all the internerves, while in *V. saccharata* the middle four internerves are

* Proc. Biol. Soc. Wash., 19:186. 1906.

† Op. cit. p. 188.

glabrous, the hairs of the lateral internerves and margins and of the second glume being also much longer than in *V. Hitchcockii;* the fruit of the latter is much smaller, less acuminate and the lemma more broadly margined than in *V. saccharata.*

This species is known only from Texas. It was also collected by G. C. Nealley, at Sanderson, Pecos County, in September, 1892, and at Del Rio, October, 1892, both collections being distributed as no. 109.

Until the South American species referable to *Valota* are better known the transfer of Nees' species of *Trichachne* to this genus is deferred.

4. Genus SYNTHERISMA Walt.

Sanguinella Gleichen, Mikrosk. Untersuch. 4. pl. 8. 1764. This includes a single species with a phrase name which is not directly associable with a previously published binomial, hence the genus is not technically published. The plate is a crude colored representation of *Syntherisma sanguinalis.*

Digitaria Haller, Stirp. Helv. 2:244. 1768, not Adanson, 1763. Haller includes two species, the first of which is Linnaeus' *Panicum sanguinale,* this name, however, being omitted and Linnaeus' diagnosis used instead as a phrase name.

Syntherisma Walt. Fl. Carol. 76. 1788. Three species are included, the first of which, *S. praecox* Walt., is taken as the type. Though there is no specimen of this now in Walter's herbarium,* there is little doubt that it the same as *Panicum sanguinale* L. as stated by Michaux † and by Elliott. ‡

Gramerium Desv. Opusc. 61. pl. 7. f. 1. 1831. This includes a single species, *G. convolutum* Desv. We have not seen Desvaux's specimen but the description and figure apply well to the South American allies of *Syntherisma adusta* (Nees) Chase, and may possibly refer to a small specimen of that species itself.

Sanguinaria Bubani, Fl. Pyren. 4:256. 1901. Four species are included, the first of which, here taken as the type, is *S. nevenarae* Bub. From the synonyms and illustrations cited this is seen to be *S. sanguinalis.*

5. Genus LEPTOLOMA Chase.

Leptoloma Chase, Proc. Biol. Soc. Wash. 19:191. 1906. Based on *Panicum cognatum* Schult., *L. cognatum* (Schult.) Chase.

6. Genus CHLORIDION Stapf.§

Chloridion Stapf in Hook. Icon. Pl. 27:[2] pl. 2640. 1900. A single species, *C. cameroni* Stapf, from "British Central Africa: * * * Namasi,

* For an account of the grasses in Walter's herbarium see Hitchcock, Sixteenth Ann. Rept. Mo. Bot. Gard. 44. 1905.

† Fl. Bor. Amer. 1:45. 1803.

‡ Bot. S. C. & Ga. 1:131. 1816.

§ It is intended to discuss in detail this and other extra-American genera in a later paper, when the spikelets of the type species will be figured.

Cameron, 15 (coll. of 1899),'' is included in the genus. The type has not been examined but the description and plate identify the species with the following.

Stereochlaena Hack. Proc. Rhodesia Sci. Assoc. 7 : 2 65. 1908. One species, *S. Jeffreyssii* Hack., ''Bulawayo, Maio, 1907, leg. Jeffreys, no. 46, 83.'' Professor Hackel kindly sent spikelets of the type for deposit in the National Herbarium, and stated in a letter that *Stereochlaena* ''is identical with *Chloridion* Stapf, Hook. Ic. 2640 (1900).''

In this genus the fruit is cartilaginous-indurated, brown, papillose, the margins of the lemma white and hyaline, as in the other genera of this group. The inflorescence consists of few to several slender racemes, digitate at the summit of the culm; the short-pediceled, lanceolate, spikelets are in pairs, the first glume is wanting, the second a minute scale; the sterile lemma is attenuate into a slender scabrous awn, 4 or 5 times longer than the body of the spikelet, and encloses a minute cleft palea. Stapf says ''*Chloridion* might be described as a *Digitaria* in which the lower glume is entirely suppressed and the upper reduced to a scale, whilst the lower (barren) valve runs out into a fine bristle-like awn.''

7. Genus ACRITOCHAETE Pilger.

Acritochaete Pilger in Engler, Bot. Jahrb. 32 : 53. 1902. The genus is based on one species, *A. Volkensii* Pilger (op. cit. 54) ''Ost-Afrika, am Kilimandscharo, im Grütelwald oberhalb Marangu verbreitet, 2100 m. s. m. (Volkens n. 1278.)'' A portion of a raceme from the type specimen was kindly sent to the National Herbarium by Dr. Pilger.

This genus like the preceding is very unlike any known American grass. In *Acritochaete* the scarcely indurated fruit is more like that of *Reimarochloa* or *Hymenachne* than like that of the preceding genera in texture, but the broad, white, thin-membranaceous margins of the lemma are like those found in this group. *Chloridion* is evidently related to *Syntherisma*, and *Acritochaete* is more nearly related to *Chloridion* than to any other known genus. The inflorescence consists of a few slender erect, distant racemes; the solitary, short-pediceled, lanceolate spikelets in two rows on one side of the slender raceme; the first glume is reduced to an obscure scale, the second glume and sterile lemma are attenuate into long, slender, more or less twisted and irregularly flexuous awns several times longer than the body of the spikelet, the awns of the several spikelets more or less entangled.

8. Genus THRASYA H. B. K.

Thrasya H. B. K. Nov. Gen. & Sp. 1 : 120. pl. 39. 1816. This is based on a single species, *T. paspaloides* (op. cit. p. 121). ''Crescit in calidis, subinundatis insulae Orinocensis Panumana, inter vicos Atures et San Borja.'' The type has not been examined nor has any specimen of this species. The generic characters here given are based upon a study of specimens of *Panicum thrasyoides* Trin. (*Thrasya hirsuta* Nees) and *P.*

petrosum Trin. and the other two species here listed. Judging from Kunth's description and plate 39, and allowing for evident error in each, *Thrasya paspaloides* is closely related to *P. thrasyoides* Trin. Kunth places his *Thrasya* as the last genus of "Sectio I. Paniceae" (about the equivalent of our subfamily *Panicoideae*) immediately following *Manisuris granularis* (*Hackelochloa*). He diagnoses *Thrasya* as being 2-flowered, having two glumes, "superior profunde bipartita," the halves aristate below the apex, "inferior [gluma] integra mutica." The male floret is said to have but a single palea [both valves of a floret being termed paleae]. From dissections of spikelets of *P. thrasyoides* and from plate 39 the following conclusions are reached: Kunth overlooked the small, hyaline first glume (which in *P. thrasyoides* is more or less buried in the cleft of the sterile lemma and might easily escape notice); his entire, awnless, lower glume is the second glume; his deeply divided upper glume, the sterile lemma, the aristae of the halves being not awns (prolongations of fibrovascular bundles) but stiff, quill-like hairs; the single palea of the male floret is the sterile palea. It is strange that Kunth, failing to note the first glume, did not, nevertheless, count it as obsolete, since failing to do so, and counting the second glume as the first, he describes a spikelet in which the scales are not distichous, for his male floret is immediately above the (supposed) second glume instead of on the opposite side above the first. The margins of the sterile palea (in the allied *P. thrasyoides*) are so narrow and so readily torn from the hyaline middle portion that the fact that they turned toward the supposed second glume might escape observation. Kunth describes this "flos masculus" as "subtrinervia"—being a palea it has no midnerve, where Kunth evidently looked for one. But even if this [supposed] incongruous structure of the spikelet escaped him (if it did escape him) Kunth considered his *Thrasya* a most curious grass. He states that though it resembles *Paspalum platycaule* in habit, the structure of the flowers is so singular as to be widely different from that of all known genera. Nees (Agrost. Bras. 93. 1829) in his diagnosis of *Thrasya* notes a minute, scale-like inferior glume "(a cl. Kunth neglecta.)" The further important character that Kunth neglected, that is the alternately reversed position of the spikelets on the axis, Nees takes note of in his specific description of *Thrasya hirsuta* (based on *Panicum thrasyoides* Trin.), though Trinius failed to do so.

Description.—Inflorescence a single, terminal, more or less arcuate, spike-like raceme; spikelets apparently subsessile and solitary, in a single row on one side of a channeled, more or less winged rachis (the wings partially embracing the row of spikelets), but actually in pairs (the spikelets of each pair back to back) the pedicel of the primary spikelet adnate to the midnerve of the rachis* (the spikelets spreading from the

* To account for the alternation in position of spikelets, this was the interpretation arrived at by the writer from an examination of *P. thrasyoides* and *P. petrosum*, but I should not have ventured to give it at this time had I not found that it is the conclusion of Prof. Hackel (Oesterr. Bot. Zeitschr. 51:368. 1901) in the case of *Panicum campylostachyum*, in which species the paired arrangement is more evident than in *P. thrasyoides* and *P. petrosum*.

rachis at an angle of about 45 degrees), alternate spikelets placed with the back and alternate spikelets placed with the face toward the rachis (that is, the first glume alternately introrse and extrorse), a short callus below the spikelet; first glume minute, often hyaline and nerveless; second glume membranaceous, shorter than the spikelet; sterile lemma subindurated, thinner down the middle and early splitting to the base (the margins of the split rolling inward) or deeply sulcate only, the sterile palea nearly as long as its lemma, the nerves and margins firm, the broad internerve very thin, a staminate flower present or wanting; fruit oblong-elliptic, subacute, the lemma and palea cartilaginous-indurated, papillose, the summit of the lemma often clothed with stiff hairs, the thin margins flat, more or less pubescent. Slender, branching perennials, with narrow leaves, the genus confined to the tropics of the mainland of the western hemisphere.

The strictly racemose inflorescence, the alternation in the position of the spikelets, the subindurated, split or deeply sulcate sterile lemma, and the cartilaginous (not chartaceous) indurated lemma and palea, the thin margins of the lemma flat, taken in combination, are here used to distinguish *Thrasya* from *Panicum* and *Paspalum*. *Thrasya* approaches *Paspalum* through *Thrasya cultrata* and *Panicum campylostachyum* (in which the fruit is not hairy at the summit) on the one side and *Paspalum monostachyum* (H. B. K.) Vasey (in which the slightly indurated sterile lemma is somewhat sulcate and readily splits in dissection, and the firm margins of the papillose fertile lemma are not inrolled), on the other side. In the latter species, however, the paired spikelets are in two rows, and not in the alternately reversed position of those of *Thrasya*. If we conceive of a genus as bounded by an orbiculate line in places farther from, in places nearer to, the center (the species conceived to be the type of the genus) we have *Paspalum monostachyum* close to the line in one circle and *Panicum campylostachyum* and *Thrasya cultrata* close to the line in the adjoining one, the theoretical common ancestor of both long extinct. In such cases of extra-generic affinity it seems to be the nearest approach to a natural arrangement if we place the anomalous species in the genus to the members of which it is on the whole most nearly allied. And *Paspalum monostachyum* finds its nearest allies in *Panicum unispicatum* Scribn. & Merr. and a few other species of the section *Harpostachys* or *Dimorphostachys* of *Paspalum*.

The following species belong to this genus:

Thrasya paspaloides H. B. K. Nov. Gen. & Sp. 1 : 121. pl. 39. 1816. (See above.)

Panicum thrasya Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : [2]228. 1834. Based on *T. paspaloides* H. B. K. Only the Humboldt and Bonpland specimen is mentioned. It is possible that this species has not been collected a second time.

Thrasya thrasyoides (Trin.).

Panicum thrasyoides Trin. Gram. Pan. 126. 1826. "Brasil. (Langsdorff)." The type specimen, in the Trinius Herbarium, is labeled

"Panicum thrasyoides m. ubique in campis siccis, Brasiliae crescens, leg. mense Dec. 1824. cl. Langsdorff."

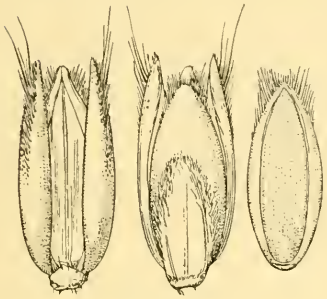

Fig. 1.
Thrasya thrasyoides.
(Two views of spikelet and fruit x 10 diam.)

Thrasya hirsuta Nees, Agrost. Bras. 94. 1829. Based on *P. thrasyoides* Trin. Nees distinguishes between this and *T. paspaloides*, a specimen of the original collection of which he examined in the Willdenow Herbarium. We take it on his authority that the two are distinct. So far as we know they have not been united, but they are closely allied and it seemed possible that Kunth's erroneous description might have led to failure to recognize his species.

Thrasya petrosa (Trin.).

Panicum petrosum Trin. Gram. Icon. 3: pl. 280. 1836. Trinius states that the illustration is "ad specimen Brasilianum." The type specimen, in the Trinius Herbarium, labeled "Panicum petrosum m. Cuyaba febr. 1827," was probably collected by Langsdorff.

Tylothrasya petrosa Doell, in Mart. Fl. Bras. 2 : ^{2}295. pl. 37. 1877. Based on *Panicum petrosum* Trin. Doell bases his genus *Tylothrasya* on this species, the basal callus being the character by which he differentiates it from *Thrasya* H. B. K. *Thrasya thrasyoides*, however, has this callus though it is less pronounced than in *T. petrosa*. Bentham (Linn. Soc. Journ. Bot. 19 : 42. 1881) misspells the specific name "petraeum."

Thrasya cultrata (Trin.) Nees, Agrost. Bras. 94. 1829.

Panicum cultratum Trin. Gram. Pan. 126. 1826. "Brasil (Langsdorff)." The type specimen, in the Trinius Herbarium, is labeled "Panicum cultratum m. In graminosis, m. da Congonhas, Brasil. leg. mense Jan. 1825. cl. de Langsdorff. Thrasya cultrata N. ab Esenb." Above this the name "cultratum" had been written and crossed out, apparently by Trinius himself, and "monostachyum Hb. Kth." added. In his later work, "Panicearum Genera" (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : ^{2}228. 1834) Trinius gives *P. cultratum* as a synonym of *P. monostachyum*.

Thrasya campylostachya (Hack.).

Panicum campylostachyum Hack. Oesterr. Bot. Zeitschr. 51 : 367. 1901. "Costarica; in savannis ad Cañas Gordas leg. Pittier, nr. 11012 et 11018." The type (no. 11012) is in Hackel's herbarium, a duplicate is in the National Herbarium.

This and the preceding species differ from the first three here listed in the lack of the quill-like hairs on the halves of the split sterile lemma, and also on the summit of the fruit.

There are several South American species, *Panicum Schumannii* Pilger among them, at present insufficiently known to us, which belong in this genus.

9. Genus ECHINOLAENA Desv.

Echinolaena Desv. Journ. de Bot. Paris 1 : 75. 1813. This genus is based on a single species, *E. hirta* Desv. (l. c.) "*Habitat* in America *equinoxiali.*" The type specimen, bearing in Desvaux's handwriting the name and date as published, is in the herbarium of the Muséum d'Histoire Naturelle at Paris.

Echinolaena was recognized as a genus by Kunth (H. B. K. Nov. Gen. & Sp. 1 : 118. 1816, Rév. Gram, 1 : 54. 1829, and Enum. Pl. 1 : 171. 1833), and by Trinius in his earlier work (Gram. Pan. 75. 1826), though later (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : [2]230. 1834) he includes it under his section *Harpostachys* of *Panicum*. Nees (Agrost. Bras. 127. 1829) makes it a section of *Panicum*. Steudel follows Trinius' later disposition of the genus, as does Doell (Mart. Fl. Bras. 2 : [2]179. 1877). Bentham (Linn. Soc. Journ. Bot. 19 : 50. 1881) maintains *Echinolaena* as a genus because of its having "the rigid single spike of some Chlorideae," and in the Genera Plantarum (Benth. & Hook. Gen. Pl. 3 : 1107. 1883), also, he gives it generic rank. Hackel (Engler & Prantl, Pflanzenf. 2 : [2]35. 1887) reduces it to a section of *Panicum*.

Description.—Inflorescence of one dense and spike-like, or several rather loose racemes; spikelets in pairs, face to face, the primary short-pediceled and perfect the secondary subsessile, abortive (sometimes developed, rarely wanting), the back of the primary spikelet turned toward the axis (that is the back of the fruit turned from the axis), in two rows along one side of a flat rachis and more or less divergent from it; fertile spikelets laterally subcompressed, echinate, at least at maturity; glumes broad, firm, acuminate-pointed, one or both echinate at maturity, the first straight and as long as the spikelet or longer, the second boat-shaped or becoming ventricose; sterile lemma broad, acuminate, enclosing a nearly equal sterile palea and usually a staminate flower; fruit indurated, less so than usual in *Panicum*, plano-convex, elliptical, the margins of the lemma flat or inrolled at the summit only, a minute membranaceous wing or spongy thickening on either side at base. Freely branching, more or less decumbent or creeping herbs, the type species confined to the South American tropics, another of widespread tropical distribution and a third of Madagascar.

The statement made by Bentham (Benth. & Hook. Gen. Pl. 3 : 1107. 1883): "rhachi spicæ rigida ultra spiculas producta," and which appears from the Conspectus (page 1078) to express his chief reason for maintaining *Echinolaena* as a valid genus, is found to be erroneous. The uppermost spikelet in *E. scabra* (*E. hirta*), the one species Bentham admitted to the genus, (as well as in *E. polystachya*) is strictly terminal, the rachis not at all produced beyond its insertion. This uppermost spikelet is solitary and usually erect, and the first glume is long-acuminate

(longer than in the other spikelets) and has much the appearance of a hirsute prolongation of the rachis. The characters to which we here give chief weight as generic are the strictly racemose inflorescence, the paired spikelets face to face (exactly the opposite arrangement to that in *Thrasya*), the lower or secondary spikelet of the pair abortive or usually so, the fertile spikelet with its back to the axis (as in *Brachiaria*), the long first glume, and the fruit less indurated than in *Panicum*.

Raceme solitary, terminal on the culm or branches; second glume boat-shaped only . . . . . *E. inflexa.*
Racemes several, erect, distant along a common axis; second glume becoming ventricose and uncinate-spiny at maturity . . *E. polystachya.*

Echinolaena inflexa (Poir.).

Cenchrus inflexus Poir. Encyc. Suppl. 6 : 50. 1804. "M. Richard l'a recueillie à Cayenne. (*V. s. in. herb.* Jussieu & Lam.)" The type specimen in the herbarium of the Muséum at Paris was examined by Prof. Hitchcock and found to be the same species as the type of *Echinolaena hirta* Desv. in the same herbarium. Trinius (Gen. Pan. 75. 1826) also referred *C. inflexus* Poir. to *E. scabra* H. B. K. Poiret observes that he finds no involucre, that the species may belong to another genus, and that it deserves further study.

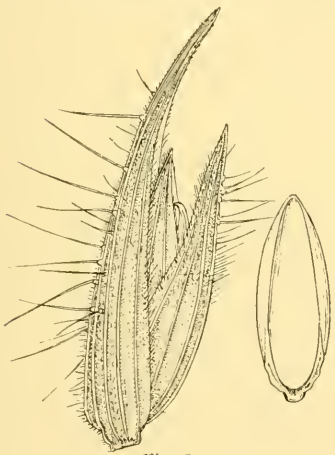

Fig. 2.
Echinolaena inflexa.
(Spikelet and fruit x 6⅔ diam.)

Cenchrus marginalis Rudge, Pl. Guian. 19. pl. 25. 1805. No locality nor specimen is cited. The type has not been examined but the plate and description identify the species.

Echinolaena hirta Desv. Journ. de Bot. Paris 1 : 75. 1813. (See above.)

Echinolaena scabra H. B. K. Nov. Gen. & Sp. 1 : 118. pl. 38. 1816. "Crescit in ripa umbrosa Atabapense juxta vicum San Balthasar et rupem Kemarumo. (Prov. de la Nueva Guayana.)" The type specimen has not been examined but the plate and description identify the species.

Panicum echinolaena Nees, Agrost. Bras. 128. 1829. Nees divides the entire species into three varieties, α, β and γ and cites "*Echinolaena scabra*, H. et K." as a synonym without indicating to which variety he considers it synonymous. Since he also cites specimens we can not consider *P. echinolaena* a change of name only. "Var. α et β in Brasilia meridionali. (Sellow.) Vidi in Herb. Reg. Berol.)—Var. γ in campis siccis ad Tanbaté nec non Sabara, provinciarum S. Pauli et Minarum * * * (Martius)." The specimens referred to as α and β have not been examined. The Martius specimen, the type of var. γ, in the Munich

Herbarium, is the villous form represented in the National Herbarium by *Novaes* 1248, Campinas, Brazil.

Echinolaena polystachya H. B. K. Nov. Gen. & Sp. 1 : 119. 1816. "Crescit in ripa fluminis Magdalenæ inter Tenerife et Zambrano." A part of the type, labeled "*Echinolaena polystachya* H. B. K. in ripa fluminis Magdalena, ex herb. Humb. & Bonpl.," was examined in the Berlin Herbarium. As indicated by Nees (Agrost. Bras. 129. 1829) and Trinius (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : 2 240. 1834) this is the same as *Panicum uncinatum* Raddi.

Panicum uncinatum Raddi, Agrost. Bras. 41. 1823. "In sylvaticis prope *Catumby*, non procul ab Urbe *Rio de Janeiro*." An authentic specimen from Raddi (probably a duplicate type) was examined in the herbarium of the British Museum.

Panicum heteranthum Link, Hort. Berol. 1 : 212. 1827. "Hab. in Brasilia." An authentic specimen from the Berlin Botanical Garden was examined in the Trinius Herbarium. The description also identifies the species.

Panicum glandulosum Nees, Agrost. Bras. 129. 1829. "Habitat in sylvis ad Xipotó et ad Rio Jequetinhonha flumina (Martius)" is the first specimen cited, "in confinibus regni Paraguayani legit Sellovius (Vidi in Herb. Reg. Berol.)" an additional one. The Sellow specimen was examined at the Berlin Herbarium. Nees gives *Echinolaena polystachya* H. B. K. and *Panicum uncinatum* Raddi as synonyms. Trinius (Gram. Pan. 174. 1826) gives "*Panicum glandulosum N. ab Es.* in litt." (as well as *P. uncinatum* and *Echinolaena polystachya*) without description as a synonym of *Panicum nemorosum* Swartz var. *β*.

Echinolaena Trinii Zoll. & Mor. Syst. Verz. Zoll. 102. 1846. Based on "*Panicum uncinatum* Trin. v. 3. non Brown." The reference to Trinius is probably to the "Panicearum Genera" (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : 2 240. 1834). The name published by Brown is *P. uncinulatum* not *P. uncinatum*.

Panicum echinatum Willd.; Doell in Mart. Fl. Bras. 2 : 2 193. 1877. This herbarium name is given as a synonym of *P. uncinatum* Raddi. The specimen, in the Willdenow Herbarium, bears the data "Magdalena, Humboldt," and is doubtless a duplicate of the type of *E. polystachya*.

Immature specimens of this species bear a superficial resemblance to *Ichnanthus nemorosus* (Sw.) Doell, and allied species. Trinius, as seen above, at first included it as an unnamed variety of *Panicum nemorosum*, but later (Gram. Icon. 2: pl. 216. 1829) gives *Panicum uncinatum* as a valid species, explaining that though it resembles *P. nemorosum* it differs in having a subcoriaceous lower floret, and, in the upper racemes, spikelets in which the prickles of the "inferior glume" [the plate shows the second glume is intended] are so dense and long as to produce a resemblance to spikelets of *Lappago* [*Nazia*]. Because of the racemose inflorescence Trinius here and in the Panicearum Genera (Mém. Acad. St. Pétersb.

VI. Sci. Nat. 3 : ²240. 1834) places *P. uncinatum* in the section *Brachiaria*.

Kunth (Rév. Gram. 1 : 54. 1829) doubtfully refers to *Echinolaena* his own *E. polystachya*, together with *Panicum nemorosum* Sw., *P. naviculare* Nees (both of which belong in *Ichnanthus*) and *P. brachystachyum* Nees and *P. procurrens* Nees. In his synoptical heading the character "gluma superior echinato-glochidata" would exclude all but *E. polystachya*. In the Enumeratio (Enum. Pl. 1 : 173. 1833) Kunth again doubtfully includes these species and adds *Panicum loliaceum* Bert., probably referable to *Ichnanthus*.

While the uncinate and ventricose second glume of the mature spikelet of this species makes it look very different from spikelets of *E. inflexa*, the paired spikelets, the primary fertile, the secondary abortive or rudimentary, placed face to face, the back of the primary one turned toward the rachis, and the essentially like structure of the spikelet to that of *E. inflexa* show the two species to be congeneric. The second glume becomes indurated and spiny only as the spikelet nears maturity; the immature spikelets resemble those of *E. inflexa*. The sterile spikelet is often reduced to a mere rudiment, is sometimes wanting, and is rarely developed like the primary spikelet. In the fifty specimens of this species in the National Herbarium none are found without some of these sterile spikelets in the racemes.

From the description, *Echinolaena madagascarensis* Baker, a species which we have not seen, appears to belong unmistakably to this genus.

10. Genus MESOSETUM Steud.

Mesosetum Steud. Syn. Pl. Glum. 1 : 118. 1854. This is based on a single species, *M. cayennense* Steud. (l. c.) "*Leprieur* legit in Cayenne." The type specimen, labeled "Mesosetum cayennense Steud. Cayenne. Leprieux, 1825," in the Steudel Herbarium at Paris, is found to be the same species as *Panicum rottboellioides* H. B. K. Steudel earlier (Flora 33 : 228. 1850) mentions the name in a paper on the progress of his work on the "Synopsis plantarum." The generic description as given by Steudel is faulty and misleading. He evidently became confused as to the morphology of the parts of the spikelet. But reading his description with a dissected spikelet of *P. rottboellioides* under the microscope one can see that this is what Steudel is trying to describe. It seems likely from his description of the "flosculus hermaphroditus" that he mistook the sterile lemma with the fertile floret enfolded for the hermaphrodite floret (that is mistaking the fertile lemma for the "second valve" of the floret). Steudel's statement that *M. cayennense* approaches *Panicum mesocomum* Nees is further misleading. For this reason the name *Mesosetum* has been referred to various sections of *Panicum* but never, so far as we can find, to the group containing *Panicum rottboellioides*, until so used by Hitchcock (Contr. Nat. Herb. 12 : 211. 1909). Bentham (Linn. Soc. Journ. Bot. 19 : 42. 1881) says that *Panicum leucophaeum* H. B. K. (which is *Panicum insulare* (L.) Meyer, *Valota insularis* (L.) Chase)

"appears to have been the type of the proposed genera *Acicarpa*, Raddi, *Eriachne*, Philippi, and *Holosetum* and *Mesosetum* Stend." (It is in fact the type of only the first-named of these.) In the Genera Plantarum (Benth. & Hook. Gen. Pl. 3 : 1101. 1883) he says that *Mesosetum* is perhaps (*forte*) referable to the section *Trichachne* of *Panicum*. At the same time Bentham (Linn. Soc. Journ. Bot. 19 : 42. 1881) establishes as a section of *Panicum* his *Diplaria* comprising "*P. rottboellioides*, H. B. K., *P. exaratum* and *P. ferrugineum* Trin., *P. pappophorum*, Nees, and a few others." In the Genera Plantarum (l. c.) this section is described and the same species mentioned as belonging to it. Dalla Torre and Harms (Gen. Siphonog. 14. 1900) also include *Mesosetum*, together with *Alloteropsis* Presl, *Coridochloa* Nees, *Eriachne* Phil., as well as *Acicarpa* Raddi and *Trichachne* Nees which properly belong there, under *Panicum*, section *Trichachne*. Steudel himself failed to see the identity of his *Mesosetum cayennense* with *P. rottboellioides* or its affinity to the other species of this group which he includes under the section *Harpostachys* (Syn. Pl. Glum. 1 : 55. 1854). It was only Prof. Hitchcock's examination of the type specimens of *Mesosetum cayennense* and *P. rottboellioides*, both now in the Herbarium of the Muséum d' Histoire at Paris, that revealed the specific identity of the two. It is unfortunate that Steudel's generic name, with its inadequate description, must stand for this well-marked genus. But if the names of all incorrectly described genera were rejected the nomenclature of the *Gramineae* would undergo many changes, for this family seems particularly to have suffered from the misunderstanding by authors, of the morphology of the parts of its inflorescence. *Anthaenantia*, *Ichnanthus*, *Alloteropsis* and *Pentarrhaphis* are examples of valid genera incorrectly described by the authors who bestowed the names we use for them.

Description.—Inflorescence a single, terminal, erect, spike-like raceme, the spikelets subsessile, solitary, alternate in two rows on one side of a three-angled, rarely winged, tortuous or zigzag rachis, the spikelets with the back of the fruit turned from the median line of the rachis (the first glume towards it), ventricose on the side toward the rachis, and fitting into its concavities, the back of the spikelet flat or nearly so; glumes 3- to 5-nerved (when 5-nerved the lateral pairs of nerves approximate) the lateral nerves often uniting with the midnerve below the acute or acuminate summit, one or both usually clothed on the margin with stiff hairs; sterile lemma like the glumes in texture and the distribution of the pubescence, usually appearing 2-keeled from the strong lateral nerves and firm lateral internerves and thin or hyaline middle internerves and weak midnerve; sterile palea wanting except in the section *Bifaria;* fruit pointed, ventricose on the face (palea side) usually straight on the back, the lemma and palea less indurated than in *Panicum*, the flat margins of the lemma not hyaline. Slender perennials with narrow leaves, the uppermost reduced to a bladeless or nearly bladeless sheath.

This genus, like *Brachiaria*, differs from *Panicum* in the strictly racemose inflorescence and reversed position of the spikelets, and further in the form of the spikelets, swollen or ventricose on the face (or first glume

side) instead of on the back as in *Panicum*, *Paspalum* and, in more or less pronounced form, in all other genera of the *Paniceæ*. The fruit differs from that of *Panicum* in having less indurated lemma and palea, the margins of the lemma flat. Doell (in Mart. Fl. Bras. 2 : [2] 173. 1877) states that in this group of plants the caryopsis has a linear hilum, but the specimens in the National Herbarium are not mature enough to permit of verification of this statement. The genus is confined to the tropics of the western hemisphere, Brazil being the center of distribution, two species occurring in the West Indies.

Besides *Mesosetum* proper the genus contains a well-marked section.

First glume awnless; lower floret neuter . . . *Mesosetum* proper.
First glume awned; lower floret staminate . . . Section *Bifaria*.

MESOSETUM proper.

This contains the following species:

Mesosetum rottboellioides (H. B. K.) Hitchc. Contr. Nat. Herb. 12 : 211. 1909. Based on *Panicum rottboellioides* H. B. K.

Panicum rottboellioides H. B. K. Nov. Gen. & Sp. 1 : 96. pl. 32. 1816. "Crescit in humidis ripæ Orinocensis inter Maypures et montem Sipapo."

Mesosetum cayennense Steud. Syn. Pl. Glum. 1 : 118. 1854. (See above.)

Fig. 3.
Mesosetum rottboellioides.
(Spikelet, first glume, second glume, sterile lemma and fruit x 10 diam.)

Mesosetum Wrightii Hitchc. Contr. Nat. Herb. 12 : 211. 1909. "Wright 3859 no. 559961 in the U. S. National Herbarium."

This species is known only from Cuba.

Mesosetum exaratum (Trin.).

Panicum exaratum Trin. Gram. Pan. 160. 1826. "Brasil. (LANGSDORFF.)" The type specimen, in the Trinius Herbarium, is labeled "Panicum exaratum m. In pratis paludosis S. da Lapa. Brasil. leg. cl. de Langsdorff."

Panicum pappophorum Nees, Agrost. Bras. 104. 1829. "Habitat * * * provinciae Piauhiensis." The type specimen, in the Munich Herbarium, bearing the name and locality as published, was collected by Martius.

Mesosetum loliiforme (Hochst.) Chase, Bot. Gaz. 51 : 302. 1911. Based on *Panicum loliiforme* Hochst.

Panicum loliiforme Hochst. in Steud. Syn. Pl. Glum. 1 : 56. 1854. "Herbr. Dr. Hostmann nr. 1071." The type specimen is in the herbarium at Leipzig.

This is the not uncommon Cuban species which has been usually referred to *P. rottboellioides* in herbaria. It differs from *M. rottboellioides* and *M. Wrightii* in having glumes each bilaterally unsymmetrically developed, the second shorter than the first instead of being the longest scale of the spikelet as in *M. rottboellioides ; M. loliiforme* also differs in being sparingly stoloniferous.

Nees' *P. pappophorum* var. β, his specimen of which, also collected by Martius in Brazil, is now in the Munich Herbarium, is either *M. loliiforme* or a very closely allied species.

Mesosetum chlorostachyum (Doell).

Panicum chlorostachyum Doell in Mart. Fl. Bras. 2^2 : 173. pl. 28. A. 1877. "Habitat in regionibus fluminis Rio Negro (Spruce n. 885, 1310)." Spruce's no. 885 is in the Munich Herbarium.

Mesosetum ferrugineum (Trin.)

Panicum ferrugineum Trin. Gram. Pan. 1826. "Brasil (Langsdorff)." The type specimen, in the Trinius Herbarium, is labeled "Panicum ferrugineum m. In campis glareosis pr. S. Luzia, Brazil. l. *mense* Oct. 1824. cl. Langsdorff."

Panicum eriochryseoides Nees, in Trin. Gram. Pan. 160. 1826. This name is given as a synonym of *P. ferrugineum*. Nees (Agrost. Bras. 103. 1829) publishes this as a new species citing a specimen collected in Brazil by Sellow, "Vidi in Herb. Reg. Berol." What is evidently a duplicate of this is in the Trinius Herbarium. Nees gives "Panicum ferrugineum *Tr. in litt.*" as a synonym of *P. eriochryseoides*.

Mesosetum sclerochloa (Trin.) Hitchc. Contr. Nat. Herb. 12 : 212. 1909. Based on *Panicum sclerochloa* Trin.

Panicum sclerochloa Trin. Gram. Icon. 3 : pl. 283. 1836. The illustration is drawn "ad specimen Brasilianum." The type, in the Trinius Herbarium, is labeled "Panicum sclerochloa m. pr. Cuyaba febr. 1827."

This peculiar species shows an approach to the species of the section *Bifaria* in the thickened midnerve of the first glume, keeled toward the apex and protruding as a short, laterally compressed point from between the lobes of the slightly cleft summit of the glume. The midnerve of the second glume and that of the sterile lemma are similarly keeled.

Besides the species listed above, *Panicum lolium* Nees, the type specimen of which has not been examined, and a few other insufficiently known South American species belong in this genus.

Section Bifaria (Hack.).

Hackel (Oesterr. Bot. Zeitschr. 47 : 75. 1897) establishes *Panicum*, section *Bifaria* with three new Brazilian species, *P. bifarium*, *P. caudiculatum* and *P. elytrochaetum*. Professor Hackel kindly contributed to the National Herbarium a spike from the type specimen of *P. bifarium;* the other two species have not been examined. The spikelets of *P. bifarium* have the structure and reversed position characteristic of *Mesosetum* but differ strikingly in the character of the first glumes. In these the midnerve, which (as in most species of *Mesosetum* proper) is joined by the lateral nerves, is keeled toward the summit of the notched glume and extends into a laterally compressed, sinuous, stout awn, varying from a short point to as long again as the spikelet. The species differs further from those of *Mesosetum* proper in having a staminate flower in the lower floret. Prof. Hackel points out the relationship of his section *Bifaria* to Bentham's section *Diplaria* (*P. rottboellioides*, *P. loliiforme*, etc.), and because of this relationship establishes for his three species a section of *Panicum* instead of a new genus. But unless the boundaries of the genus *Panicum* are extended to the limits to which Trinius (Gram. Pan. 1826) stretched them, including *Paspalum*, *Oplismenus*, *Setaria* and other genera recognized as distinct by even the most conservative students of *Gramineae*, the species here referred to *Mesosetum* with their constant combination of characters and their sharp delimitation from *Panicum* (there being no intergrading species as between *Panicum* and *Paspalum* and between *Panicum* and *Chaetochloa*) can not well find place therein.

The only species of the section *Bifaria* we have seen is here transferred:

Mesosetum bifarium (Hack.).

Panicum bifarium Hack. Oesterr. Bot. Zeitschr. 47 : 76. 1897. "Serra da Baliza ad Cachoeiras da Vargem Grande, 5–I. 1895, Glaziou nr. 22455."

Bifaria bifaria Kuntze, Gen. Pl. 3 : [2]359. 1898. Based on *Panicum bifarium* Hack. Kuntze, apparently without having seen the species, raises Hackel's section, on account of the lobed and awned first glumes, to generic rank in order to be consistent, he having maintained *Oplismenus* and *Chaetium* as distinct genera, he says, because of this characteristic.

11. Genus LEUCOPHRYS Rendle.

Leucophrys Rendle, Cat. Afr. Pl. Welwitsch 2 : [1]193. 1899. This genus is based on a single species, *L. mesocoma* (Nees) Rendle (op. cit. 194) based on *Panicum mesocomum* Nees, an African species. In this genus the spikelets are placed with the back of the fruit turned from the axis, but, not being strictly racemose, this is not readily observed. The rachilla is produced into a short stipe below the first glume which is separated from the second by the slightly prolonged second joint of the rachilla. The nearly glabrous first glume about as long as the spikelet and the densely silky second glume and sterile lemma, as well as the narrow

panicle and the reverse position of the spikelets, suggest an approach to the unique North American *Panicum ciliatissimum* Buckl. The stipitate spikelet of *Leucophrys,* however, with a joint between the glumes, and the different arrangement of the silky pubescence on the second glume and sterile lemma (a dense ring of long hairs across the middle of the spikelet, an arrangement also found in *Panicum nigropedatum, P. serratum, P. argenteum,* etc., and approached in several species of *Eriochloa*) does not show a close affinity with *P. ciliatissimum.* Species intermediate between them may be found, but without such intermediate species our *P. ciliatissimum* finds a more natural place in *Panicum.* Study of more material may show that *Panicum argenteum* and its allies should be placed in *Leucophrys.*

Rendle (l. c.) places *Leucophrys* immediately before *Tricholaena* to which he compares it. The silky spikelets resemble outwardly those of *Tricholaena* but the indurated fruit and membranaceous, entire and awnless second glume and sterile lemma indicate but remote relationship to that genus. The two, however, probably belong closer together than is indicated by their relative position in the sequence here given, but it must be borne in mind that any lineal arrangement of that which is really irregularly radiate must fail to show all but the closest relationship.

12. Genus ERIOCHLOA H. B. K.

Eriochloa H. B. K. Nov. Gen. & Sp. 1 : 94. pl. 30 and 31. 1816. Two species are included, *E. distachya* H. B. K. (l. c. pl. 30) "Crescit in ripa Orinoci fluminis inter Santa Barbara et Esmeraldam," and *E. polystachya* H. B. K. (l. c. pl. 31.). Since both are illustrated and are equally covered by the generic description the first species is here taken as the type of the genus. A duplicate type of this, "Ex herb. Humboldt," was examined in the Berlin Herbarium.

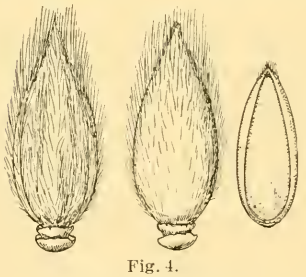

Fig. 4.
Eriochloa distachya.
(Two views of spikelet and fruit x 10 diam.)

Helopus Trin. Fund. Agrost. 103. pl. 4. 1820. A single species, *H. pilosus* Trin. (op. cit. 104) is included. Since the genus only and not the species is described and since no specimen is cited we should consider the species based on *Milium ramosum* Retz., which is cited as a synonym, save for the fact that plate 4 shows an aristate lemma while Retzius (Obs. Bot. 6 : 12. 1791) states that the "valvula exterior" is mucronate only, and that Trinius later (Gram. Pan. 118. 1826) gives *Helopus pilosus* Trin. as a synonym of *Paspalum punctatum* Flügge (*Milium punctatum* L.), while *Milium ramosum* Retz. he gives as a synonym of *Paspalum annulatum* Flügge. In the Trinius Herbarium is a specimen collected by Mikan in Brazil, which is marked in Trinius' hand "Helopus pilosus m. Paspalum punctatum Flügge." Whether or

not this specimen be taken as the type of *H. pilosus* we know that the species *Eriochloa punctata* (L.) Hamilt. (Prod. Pl. Ind. Occ. 5. 1825), based on *Milium punctatum* L., should be taken as the type of the genus *Helopus* Trin.

Trinius places *Eriochloa* H. B. K. immediately after *Helopus* in his systematic arrangement and (page 75) differentiates the two as follows:

> Racemi ad rachin communem. Cor. apice mucronato-aristata . Helopus.
> Racemi subpaniculati. Involucrum stellato-setosum! . . . . . Eriochloa.

Probably Trinius had not at that time seen Kunth's species and was impressed by Kunth's description of an involucre of numerous hairs at the apex of the pedicel and by the ring of spreading hairs shown in plate 30. Later (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : 2 130 and 133. 1834) the species of both *Eriochloa* and *Helopus* are placed in *Paspalum* in the subdivision *Helopus*.

Oedipachne Link, Hort. Berol. 1 : 51. 1827. This includes a single species, *O. punctata* Link (l. c.), based on *Milium punctatum* L. In his additions and emendations (p. 273) Link directs that *Oedipachne* be expunged and *Helopus* Trin. be inserted in its place, and in the second volume (Hort. Berol. 2 : 199. 1833) *Helopus* is given as a genus with *Oedipachne* as a synonym. *Eriochloa* H. B. K. seems to have been overlooked by Link.

Alycia Willd.; Steud. Nom. Bot. ed. 2. 1 : 66. 1840. This herbarium name is listed without description, and two undescribed species, *A. coarctata* Willd. and *A. distachya* Willd., are listed under it. Both names are here referred to *Helopus brachystachys* but on page 747 *A. coarctata* Willd. is referred to *Paspalum polystachyum* Trin. and *A. distachya* to *P. brachystachyum* Trin. *Helopus brachystachys* Trin. (upon which *Paspalum brachystachyum* is based) is *Eriochloa distachya* H. B. K. or a very closed allied species, while *Paspalum polystachyum* Trin. is based on *Eriochloa polystachya* H. B. K., so that whichever species be taken as the type of *Alycia* this name becomes synonymous with *Eriochloa* H. B. K. Willdenow's herbarium name is spelled "Aglycia" by Steudel (op. cit. 37) with the same two species listed under it.

Nees (Agrost. Bras. 16. 1829) recognizes *Helopus* Trin. as a genus, and does not mention *Eriochloa*. Probably since neither of Kunth's species was from Brazil Nees neglected to study the genus.

Doell (Mart. Fl. Bras. 2 : 2 123. 1877) recognizes *Helopus* Trin. as a genus, and includes *Eriochloa* H. B. K. under it. Bentham (Benth. & Hook. Gen. Pl. 3 : 1099. 1883) recognizes *Eriochloa* H. B. K.

Nash (Bull. Torrey Club 30 : 374. 1903) takes up the name *Monachne* Beauv. for this genus, but we do not find this name tenable. It is based on *M. unilateralis* Beauv., an undescribed species unrecognizable from the figure, which represents a branching paniculate inflorescence, though the spikelets were evidently drawn from some species of *Eriochloa*, and *Saccharum reptans* Lam., which is a species of *Panicum* allied to *P. urvilleanum* Kunth.

Description.—Inflorescence of one to many, usually dense, racemes along a common axis; spikelets solitary, sometimes in pairs, short pediceled or subsessile in two rows on one side of a narrow, usually hairy rachis, the pedicels often clothed with long stiff hairs [the "involucre" of Kunth], the back of the fertile lemma turned from the rachis; spikelets dorsally compressed, more or less pubescent, stipitate by the lengthening of the internode of the rachilla below the second glume into a more or less ring-like, usually dark-colored callus, the first glume reduced to a minute sheath about this internode and adnate to it; second glume and sterile lemma equal or nearly so, acute or acuminate, the lemma usually enclosing a hyaline palea and sometimes a staminate flower; fruit indurated, less so than in *Panicum*, minutely papillose-rugose, the lemma mucronate-pointed or aristate, sometimes pubescent at the apex, the margins slightly inrolled. Perennial herbs with linear leaves and terminal panicles of few to many racemes, confined to the warmer temperate and tropical regions of both hemispheres.

This genus approaches *Leucophrys* and *Brachiaria* through such species as *Panicum nigropedatum* Munro, *P. argenteum* R. Br., and *P. serratum* R. Br. in which the first glume is well developed above the more or less stipitate base.

13. Genus BRACHIARIA (Trin.) Griseb.

Brachiaria Griseb. in Ledeb. Fl. Ross. 4 : 469. 1853. Grisebach here raises "Panicum sect. Brachiaria Trin." (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : [2] 194. 1834) to a genus, including under it a single species *B. eruciformis* (Smith) Griseb. based on *Panicum eruciforme* Smith (Sibth. Fl. Graec. 1 : 44. pl. 59. 1806). "In arvis circa Junonis templum in insula Samo." The plate is a good representation of the species and fully identifies it. The enlarged portion of the raceme (f. A) shows that the spikelets are placed with the first glume toward the axis. This species we here take as the type of the genus. Roemer & Schultes (Syst. Veg. 2 : 426. 1817) misspell the name "*cruciforme*," and in this form also it appears in the Index Kewensis under *Brachiaria*.

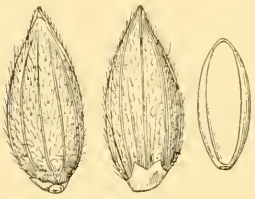

Fig. 5.
Brachiaria eruciformis.
(Two views of spikelet and fruit x 10 diam.)

Grisebach cites not the first work in which Trinius proposes the subgenus *Brachiaria*, but a later work, in which Trinius includes a somewhat different group of species from those included in his first establishment of the section in "De Graminibus paniceis" (pages 51 and 125. 1826). Here (p. 51) the section is diagnosed as follows: Racemes simple, regularly or irregularly alternate; spikelets oblong (rarely lanceolate), either in regular series and imbricated or laxly disposed; lower glume manifest, awnless. Under it are included "Thrasya Kth.? * * *

Urochloa Pal. [de Beauv.] * * * Streptostachys Desv., Echinochloa Pal." In the body of the work (p. 125) the first species included under section *Brachiaria* is *Panicum decumbens* Roem. & Schult. (*Paspalum decumbens* Poir.), the species which later (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : 2 227. 1834) is the first included under section *Harpostachys* of Trinius. This is followed by *Panicum thrasyoides* and *P. cultratum* (species of *Thrasya*), several species of Panicum (in the stricter sense) and of *Echinochloa; P. holosericeum* and *P. argenteum*, in which the spikelets are in the reversed position and which are the first species under section *Brachiaria* as later used by Trinius, are here only the seventeenth and eighteenth species under that section. In the "Panicearum Genera" (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3 : 2 194. 1834), which Grisebach cites, Trinius makes *Brachiaria* the eighth section of *Panicum*, *Harpostachys*, to which are relegated the species with a single raceme earlier included in *Brachiaria*, being the seventh. The characters now assigned to *Brachiaria* are: Simple, alternate racemes, the partial axes angled (usually 3-angled); sessile or short-pediceled, glabrous, pilose, or lanate, awnless spikelets, imbricated in 2, 3, or 4 series. No species is here mentioned, but under "VIII Brachiaria" (pages 233–247) this purely artificial division contains thirty diverse species referable to *Brachiaria* (as here limited), *Echinolaena*, and the greater number to *Panicum*. Since there is nothing in either work to indicate which species should be considered the type, it seems best to follow Grisebach's choice when he established *Brachiaria* as a genus. His choice, to be sure, was guided by the fact that *Panicum eruciforme* was the only one of the group which occurred in the Russian Empire, but even so, it would be unwise to reject his type and arbitrarily to choose another. *Panicum eruciforme* is included, under the name "*Panicum Isachne* Roth!" by Trinius in the first subdivision of his section *Brachiaria* as limited in the "Panicearum Genera." Later in the "Graminum Supplementa" (op. cit. 4 : 1 103. 1836) he states that *P. Isachne* should be called *Panicum eruciforme*. Trinius' first three species, *P. holosericeum* R. Br., *P. argenteum* R. Br. and *P. serratum* Spreng., are of that peculiar group of Old World species with reversed spikelets clothed with silvery hairs more or less aggregated across the middle of the second glume and sterile lemma, and having a well-developed first glume, which, together with *Leucophrys*, appear to be a connecting link between *Eriochloa* and *Brachiaria*. In the present state of our knowledge it is difficult to say whether these species fall the more naturally into *Brachiaria* or into *Leucophrys*.

Grisebach does not mention the reversed position of the spikelets in *Brachiaria*, and later (Goett. Abh. 7 : 263. 1857) transfers to this genus *Panicum prostratum* Lam. (*P. reptans* L.), a species in which the spikelets are not in the reversed position. In the "Flora of the West Indies" (page 545. 1864) Grisebach uses "Brachiaria Tr." as a section of *Panicum*, including under it *Panicum paspaloides* Pers. [*P. geminatum* Forsk. is intended] and three species of *Echinochloa*.

Steudel (Syn. Pl. Glum. 1 : 56. 1854) follows Trinius' own later limitation of the subgenus *Brachiaria*.*

Bentham (Benth. & Hook. Gen. Pl. 3 : 1102. 1883) uses the name *Brachiaria* for a section of *Panicum* and in about the sense equivalent to the group *Geminata* (Hitchc. & Chase, Contr. Nat. Herb. 15 : 30. 1910). Hackel (Engler & Prantl. Pflanzenf. 2 : [2] 35. 1887) also uses it as a section of *Panicum* and apparently in the same way, his diagnosis being: Inflorescence as in *Paspalum*, spikelets awnless.

Nash (Britton, Man. 77. 1901) recognizes *Brachiaria* as a genus (giving Ledebour as the author), differentiating it by the racemose inflorescence and awnless spikelets of 3 glumes. Two species, *Panicum digitarioides* (*P. hemitomon* Schult.) and *P. obtusum* H. B. K., in both of which the spikelets are in the position normal for *Panicum* and *Paspalum*, not the reversed position of *Brachiaria eruciformis*, are transferred to it. Later (in Small, Fl. Southeast. U. S. 50 and 80. 1903) Nash adds to his diagnosis of the genus *Brachiaria* "flowering scale with its opening toward the rachis," thus limiting the genus to Grisebach's type species and its allies. *Panicum digitarioides* and *P. obtusum* he here restores to *Panicum*. Hitchcock (Contr. Nat. Herb. 12 : 141. 1908) accepts *Brachiaria* in this emended sense, separating it from *Panicum* chiefly on account of its "having spikelets so placed that the fertile floret stands with its palea toward the axis."

Milium Bubani, Fl. Pyren. 4 : 259. 1901, not L. 1753. This includes a single species, *M. alternans* Bubani, based on *Panicum eruciforme* Smith. No generic description is given but something of the author's concept of the genus is shown by his statement that it is not possible to separate *Panicum beckmanniaeforme* Mikan (*P. geminatum* Forsk.) from *Milium alternans*, indicating that *Milium* is used in the historic sense.

Description.—Inflorescence of several to many dense racemes along a common axis; spikelets solitary, rarely in pairs, subsessile in two rows on one side of a 3-angled, sometimes narrowly winged rachis, the back of the fertile lemma turned from the axis; spikelets dorsally compressed, sometimes turgid; first glume usually less than half the length of the spikelet; second glume and sterile lemma equal or nearly so, 5- to 7-nerved, the lemma enclosing a hyaline palea and sometimes a staminate flower; fruit indurated (in the type species smooth and shining) usually papillose-rugose, the margins of the lemma inrolled, the apex rarely mucronate pointed. Annual or perennial, branching herbs with linear leaves, the culms often decumbent and rooting at the lower nodes, confined to the warmer temperate and tropical regions of both hemispheres.

Brachiaria is here distinguished from allied genera by the strictly racemose inflorescence and reversed position of the spikelets (in which the first glume is present) taken in combination.

*Schlechtendal's stricture (Linnaea 26 : 537. 1853) of Steudel for including under *Panicum* section *Brachiaria* Trin. a different aggregation of species from that included under it by Trinius himself, must have been made in ignorance of Trinius' later paper, for Steudel, not only includes the same species as did Trinius, but gives them in the same order, only interspersing a few of what he considers allied species.

Among North American species of *Panicum* two approach *Brachiaria* or *Leucophrys*, *Panicum texanum* Buckl. and *P. ciliatissimum* Buckl., in which the inflorescence is not strictly racemose, but in the first of which the spikelets toward the ends of the branches are often in the reverse position of those of *Brachiaria*, while in the second all the spikelets are in the reverse position. The rugose apiculate fruit of both also recall the fruit of *Eriochloa* and of one species of *Brachiaria*, *B. meziana* Hitchc., but the spikelets are not in one-sided racemes.

14. Genus AXONOPUS Beauv.

Axonopus Beauv. Ess. Agrost. 12 and 154. 1812. A brief diagnosis is given and the following species cited as belonging to the genus: "*Milium compressum* [*Axonopus compressus* (Swartz) Beauv.], *digitatum* [*Syntherisma digitata* (Swartz) Hitchc.], *cimicinum* [*Panicum cimicinum* (L.) Retz., *Coridochloa cimicina* (L.) Nees], *paniceum* [a species of *Syntherisma*]." There is little in the diagnosis or observations to favor one species more than another as the type, but such as there is favors *M. compressum*, since *Axonopus* is differentiated from *Ceresia* and *Paspalum* on the digitate inflorescence and solitary spikelets. All but the first species named have spikelets in pairs. This species, therefore, we take as the type of *Axonopus*. Beauvois himself expresses doubts as to the validity of his genus. He says that if *Milium* can be separated from *Paspalum* because the axis of the latter is a spike composed of spikelets alternate or geminate, the same character (*motif*) would serve to distinguish *Axonopus* in which the axis is digitate; at least if one does not reunite the three genera, forming of each a division of the same genus; this, he says, would be perhaps the most natural. But, he adds, "C'est aux Botanists à prononcer: il me suffit de leur présenter mes doutes." Next follows a brief, informal description of a plant received from "M. de Lessert," which, it appears to Beauvois, ought to belong to this genus, with the name of *Axonopus aureus*. In the index (page 154) all five species mentioned are listed under *Axonopus*, but all except "*aureus*" are followed by a question mark. But we find that under *Milium* in the index these same species are again queried. It would seem that the query refers to the author's doubts as to the advisability of keeping *Paspalum* and *Axonopus* distinct from *Milium*. The omission of the question mark after "*aureus*" may be a typographical error. However, we hold *Axonopus compressus* and *A. aureus* to be congeneric, but to belong to two rather well-marked sections.

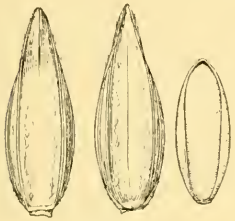

Fig. 6.
Axonopus compressus.
(Two views of spikelet and fruit x 10 diam.)

Cabrera Lag. Gen. & Sp. Nov. 5. 1816. A single species is given under this genus, *C. chrysoblepharis* Lag. "H. in America meridionali, ad Panamaidem et *Aricam* portum, ubi legit. cel. D. Lud. Neé (V. S.)." The type specimen has not been examined but the clear and detailed descrip-

tion identifies the species with that described as *Paspalum immersum* Nees. In this species and its close allies the 3-angled rachis is about 1.5 mm. wide, the margins and midrib bearing stiff golden hairs arising from papillæ, a few hairs also at the side below the spikelet, but not bearing a fascicle of hairs beneath the spikelet as in *Axonopus aureus*. The spikelets in *Cabrera chrysoblepharis* fit into shallow depressions in the rachis, the effect of an excavation being heightened by the surrounding piliferous papillæ. In *A. aureus*, to which Lagasca's species has been referred by many authors, and its close allies, the narrow rachis is ciliate on the margin (not down the center also as in *Cabrera chrysoblepharis*), and below each spikelet, "in the form of an involucre," as Beauvois says, is a fascicle of bright golden hairs exceeding the spikelets which are not set in excavations of the rachis. Nees (Agrost. Bras. 78. 1829) includes *Axonopus aureus* Beauv. (under the name *Paspalus immersus** to which he refers *A. aureus* as a synonym) and allied species under Paspalum "Sectio VI. Axonopodes." Apparently he failed to note that in these species as well as in *Paspalum compressum* and its allies, of which he makes "Sectio I. Digitariae," the solitary spikelets are in the reversed position. Nees refers "Gen. Cabrera Lag." to this section *Axonopodes*. Lagasca's species, *C. chrysoblepharis*, he refers as a synonym to his own *Paspalus exasperatus*."

Anastrophus Schlecht. Bot. Zeitschr. 8 : 681. 1850. The author discusses *Paspalum* section *Digitariae* "(spiculis inversis)" of Nees and proposes a generic name for it. He lists under this genus the names of eight species, three of them unpublished herbarium names. The first of the species (all of which are included in the section *Digitariae* by Nees) is *Paspalum platyculmum* Thou. This species, which we take as the type, was described by Nees (Agrost. Bras. 24. 1829) from a specimen bearing this name in the Willdenow Herbarium. We have not seen the specimen, which was collected in "insula S. Mauritii," but Nees' description shows it to be closely related to *Axonopus compressus*. Schlechtendal does not himself form any binomials under *Anastrophus*. Index Kewensis (1 : 118. 1893) transfers all names, including nomina nuda, mentioned by Schlechtendal in his paper. Schlechtendal does not here make any mention of *Axonopus*, but in a later paper (Linnaea 26 : 532. 1853), discussing *Axonopus* Beauv., he remarks that he has already established *Anastrophus* and has thereby begun the destruction of the genus *Axonopus* of Beauv., and that now *Cabrera* Lag. must be separated from it. [Since Nees did not mention the reversed position of the spikelets in this group, as he did in the group Schlechtendal named *Anastrophus*, neither does Schlechtendal note this character, although when discussing *Anastrophus* he laid great stress upon it.]

Hackel (Engler & Prantl, Pflanzenf. 2 : [2] 35. 1887) makes *Anastrophus* his third section of *Paspalum*, noting that the lower glume and lemma are turned from the axis. Nash (Small, Fl. Southeast. U. S. 79. 1903) recognizes *Anastrophus* as a genus.

* Nees uses throughout the masculine form of this name.

Lappagopsis Steud. Syn. Pl. Glum. 1 : 112. 1854. This genus is proposed with a single species *L. bijuga* Steud. "*Urville* legit in Ins. St. Catharin. et *Claussen* in Brasil." The Claussen specimen referred to is in the Kew Herbarium. It is found to be closely related to *Paspalum dissitiflorum* Trin., which species Nees (Agrost. Bras. 32. 1829) includes in his section "Digitariae (speculis inversis)." Hackel (Engler & Prantl. Pflanzenf. 2 : [2] 35. 1887, where the name is misspelled "*Lappagrostis*") includes it in section *Anastrophus*.

Owing to its insufficient diagnosis and the diverse species assigned to *Anoxopus* by Beauvois this name has been applied to different groups of species by different authors. Roemer & Schultes (Syst. Veg. 2 : 318. 1817) recognize it as a genus including under it the same species as did Beauvois except *A. paniceus* which, they say, is *Paspalum filiforme* [it is a species allied to *Syntherisma filiformis*]. Nees, as we have seen, used it as a section of *Paspalum* for the species allied to *A. aureus*. Hooker (Fl. Brit. Ind. 7 : 64. 1896) says of *Axonopus* "A natural genus, remarkable for the small cleft palea of gl. III [the sterile palea]. It was established by Beauvois on *Panicum cimicinum* Retz, to which other grasses having no affinity with it were added." Hooker does not state why he takes *P. cimicinum* as the basis of *Anoxopus*. It fails to agree with one of the two characters of Beauvois' diagnosis (in that its spikelets are not solitary), and it is only third in the list. Hooker here includes one other species in this genus, *A. semialatus* (based on *Panicum semialatum* R. Br.) Stapf (Dyer, Fl. Cap. 7 : 418. 1898) accepts the genus as emended by Hooker. Hitchcock (Rhodora 8 : 205. 1906; Contr. Nat. Herb. 12 : 141. 1908; Gray, Man. ed. 7. 100. 1908; Contr. Nat. Herb. 12 : 207. 1909.) recognizes *Axonopus* for the congeners of *A. compressus*.

Description.—Inflorescence of 2 to many slender racemes usually aggregated at the summit of the culm; spikelets solitary, sessile and alternate in two rows on one side of a 3-angled rachis, the back of the fertile lemma turned from the axis; spikelets depressed-biconvex, not turgid; first glume wanting; second glume and sterile lemma equal; sterile palea obsolete; fruit indurated, oblong-elliptic, usually obtuse, the margins of the lemma slightly inrolled. Stoloniferous or tufted perennials, with flat, conduplicate or involute, linear leaves; species numerous in South America, a few species extending into subtropical and warm temperate regions of North America and one or two to the warmer parts of the Old World.

The characters to which we here attach chief value as generic are the reversed and solitary spikelets (in which the first glume is wanting) and the racemes aggregated at the summit of the culm.

The genus *Axonopus* as here understood, subdivides into three rather well-marked sections as follows:

Rachis and spikelets glabrous or the latter softly pubescent, neither bearing conspicuous, stiff, spreading hairs . . . . . Axonopus proper.

Rachis and sometimes spikelets bearing conspicuous, stiff, spreading hairs.

Spikelets glabrous or minutely pubescent, the hairs of the rachis golden . . . . . Section CABRERA.
Spikelets papillose-pilose, the hairs of these and of the rachis pale . . . . . Section LAPPAGOPSIS.

In North America *Axonopus* proper is represented by the following species:

Axonopus compressus (Sw.) Beauv.

Milium compressum Sw. Prod. Veg. Ind. Occ. 24. 1788. "Jamaica; India occidentalis." No specimen of this could be found in the Swartz Herbarium, but the later detailed description of Swartz (Fl. Ind. Occ. 1 : 183. 1797) leaves no room for doubt.

Paspalum platicaulon Poir. Encyc. Suppl. 5 : 34. 1804. "Cette espèce a été recueillie à Porto-Ricco, par le citoyen Ledru. (V. s. in herb. Lam.)." The type has not been examined but the description identifies the species.

Axonopus compressus Beauv. Ess. Agrost. 12. 1812. Based on *Milium compressum* Sw.

Paspalum compressum Rasp. Ann. Sci. Nat. I. 5 : 301. 1825. Based on *Axonopus compressus* Beauv.

Anastrophus platycaulis Schlecht.; Ind. Kew. 1 : 118. 1893. Based on *Paspalum platycaule*.

Closely related to this species is a narrower-leaved form with nearly obtuse spikelets and usually few racemes which may be *Paspalum tristachyon* Lam. (Tabl. Encycl. 1 : 176. 1791. "Ex America merid. Communic. D. Richard"). This name has been referred by Trinius and others to *P. platycaule*, but Lamarck's description "spicis ternis" points to the other form. The type has not been examined.

Axonopus furcatus (Flügge) Hitchc.

Paspalum furcatum Flügge, Gram. Monog. 114. 1810. "Carolina. *Bosc. Walne.*" The type has not been examined, but the description identifies the species.

Paspalum digitaria C. Muell. Bot. Zeit. 19 : 324. 1861. "America septentrionalis, ubi forsan in Texas legit T. Drummond (coll. no. 276)." The type specimen was examined in the Berlin Herbarium.

Axonopus furcatus Hitchc. Rhodora 8 : 205. 1906.

Michaux's name *Digitaria paspalodes* and several names based upon it, *Milium paspalodes* Ell., *Paspalum elliottii* Wats., *Paspalum paspalodes* Scribn., and *Anastrophus paspaloides* Nash, have been misapplied to this species. Michaux's type specimen is *Paspalum distichum* L.*

Axonopus Rosei (Scribn. & Merr.).

Paspalum Rosei Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. 24 : 9. f. 2. 1900. "Foothills of the Sierra Madre Mountains, between

* See Hitchcock, Contr. Nat. Herb. 12 : 146. 1908.

Pedro Paulo and San Blascito, 1995 J. N. Rose, August 4, 1897." The type specimen is in the National Herbarium.

Axonopus capillaris (Lam.).

Paspalum capillare Lam. Tabl. Encycl. 1 : 176. 1791. "Ex America merid. Comm. D. Richard."

Paspalum minutum Trin. (Linnaea 10 : 293. 1836), the type of which, collected by Poeppig in Peru, was examined in the Trinius Herbarium, appears to be based on depauperate specimens of *A. capillaris*.

The only North American specimens we have seen of this species are from Costa Rica, *Pittier* 508 and *Jimenez* 146.

Axonopus laxiflorus (Trin.).

Paspalum laxiflorum Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 148. 1834. "V. spp. Bras." The type specimen, in the Trinius Herbarium, is labeled "Paspalum laxiflorum m. In saxosis pratisque humidis S. da Lapa. Langsdorff."

This species is represented from North America in the National Herbarium by *Pittier* 214, Alta Verapaz, Guatemala, and *Nelson* 2738, collected between Guichocovi and Lagunas, Oaxaca, Mexico.

Axonopus poiophyllus sp. nov.

Plants perennial, tufted, flattened at the base; culms erect, slender, compressed, 60 to 90 cm. high, simple, glabrous or minutely scabrous below the appressed-pubescent nodes, the leaves mostly crowded at the base; lower sheaths much overlapping, keeled, villous, the upper pubescent along the margin, otherwise glabrous or minutely pubescent; ligule scarcely 0.5 mm. long, erose-ciliate; blades erect, firm, linear, 8 to 35 cm. long (the uppermost reduced to 0.5 to 2 cm. long), 3 to 5 mm. wide, the apex boat-shaped as in *Poa*, the lower conduplicate at base and slightly narrower than the summit of the sheaths, usually flat above, papillose-villous toward the base on both surfaces, scabrous on the upper surface; inflorescence of about 3 slender, erect racemes, 6 to 12 cm. long, the rachis narrow, flexuous, glabrous or minutely scabrous; spikelets tinged with rose-purple, distant their own length, 3 mm. long, 1 mm. wide, oblong-elliptic, subacute, the second glume and sterile lemma slightly exceeding the fruit, minutely pubescent at the base and along the edges with appressed silky hairs, 4-nerved, the midnerve suppressed or nearly so, especially that of the glume, the lateral nerves near the margins and approximate; fruit pale, very obscurely papillose, the lemma with a minute tuft of erect hairs at the apex.

Type U. S. National Herbarium no. 860024, collected in April, 1904, in the vicinity of Secanquím, Alta Verapaz, Guatemala, by O. F. Cook & C. B. Doyle (no. 58).

This species is related to the group of cespitose South American species to which *A. laxiflorus* also belongs.

Axonopus deludens sp. nov.

Plants perennial; culms geniculate at base, leafy, strongly flattened, rather stout, 1 to 1.5 meters high, sparingly branching, glabrous, the nodes glabrous; sheaths glabrous or minutely pubescent at the summit; ligule about 0.5 mm. long, membranaceous, erose; blades rather thin and lax, linear, 15 to 45 cm. long, 8 to 13 mm. wide, flat, sparsely papillose-scabrous on the upper surface and on the margin, pubescent on the narrow auricles, glabrous beneath, the midnerve prominent; inflorescence of 6 to 15 very slender, erect or rather lax racemes, 10 to 25 cm. long, the lower mostly naked at the base, the rachis narrow, subflexuous, scabrous; spikelets purple tinged, distant about their own length or, toward the base of the raceme, remote, 3 to 3.2 mm. long, 1 to 1.2 mm. wide, obtuse, glabrous, the second glume and sterile lemma covering the fruit but not exceeding it, delicate in texture, 4- or 5-nerved, the midnerve present or suppressed even in adjacent spikelets, the lateral nerves strong; fruit papillose, smooth toward the summit and margins of the lemma, the apex glabrous or with a few obscure hairs.

Type U. S. National Herbarium no. 460803, collected Oct. 20, 1903, Barranca near Guadalajara, Jalisco, Mexico, by C. G. Pringle (no. 8761).

This species is not closely related to any other we have seen. The geniculate lower nodes suggest a stoloniferous habit, but our one specimen does not show stolons. The suppression of the midnerve in the glume or its presence is somewhat confusing, since it gives the impression of spikelets turned different ways, reverse and obverse, but turning back the glume always shows the back of the fertile lemma turned from the axis.

There are some eight or ten South American species, as yet insufficiently known, that belong in *Axonopus* proper. *Paspalum suffultum* Mikan (Trin. in Spreng. Neu. Entd. 2 : 46. 1821) is interesting as a species intermediate between *Axonopus* proper and section *Cabrera*. The axis is not ciliate but the very short pedicels bear at either side a few stiff hairs nearly as long as the spikelets.

Section Cabrera (Lag.).

Axonopus chrysoblepharis (Lag.).

Cabrera chrysoblepharis Lag. Gen. & Sp. Nov. 5. 1816. (See above under *Cabrera*.)

Paspalus immersus Nees, Agrost. Bras. 82. 1829. "Habitat in campis ultra 2000 pedes altis provinciae Minarum generalium passim." The type specimen was examined in the Munich Herbarium. This is, as Nees indicates, the species Kunth called *Paspalum aureum*, but since Kunth based this name on *Axonopus aureus* Beauv., his name is a synonym of that, misapplied to this species.

Panicum immersum Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 197. 1834. Based on *Paspalum immersum* Nees.

Panicum chrysoblephare Steud. Syn. Pl. Glum. 1 : 38. 1854. Based on *Cabrera chrysoblepharis* Lag.

Paspalum chrysoblephare Doell in Mart. Fl. Bras. 2^2 : 119. 1877. Based on *Panicum chrysoblephare* Steud.

The North American specimens of this species in the National Herbarium are all from Costa Rica: *Herb. Instit. physico-geogr. nat. costaricensis* no. 4464, collected in "Savanes de Boruca," by *Pittier & Tonduz* and no. 4638, collected between Boruca and Terraba, by *Pittier;* no. 11004 of the same series, collected by *Pittier*, is a mixture of *A. chrysoblepharis* and *A. aureus*.

Axonopus aureus Beauv.

Axonopus aureus Beauv. Ess. Agrost. 12. 1812. Beauvois states that the plant was given him by De Lessert, but does not say whence it came. The specimen could not be found in the Delessert Herbarium. The author's observation "Locustes [spikelets] sont garnies, en-dessous, et en forme d'involucre, de poils court et dorés", points conclusively to one of the species with a cluster of golden hairs subtending the spikelets, these having a narrow rachis, not a broad one in which the spikelets are sunken as in *A. chrysoblepharis*. Following Trinius (Icon. 1: pl. 97. 1828) we take the common species with the smaller and glabrous spikelets to be the true *A. aureus*. The one with larger, pubescent spikelets, *Paspalum canescens* Nees (in Trin. Gram. Pan. 89. 1826, not Roth. 1821, *Panicum chrysodactylon* Trin.), the type of which was examined in the Trinius Herbarium, has not been found in North America and for the present need not be transferred. The species of this group extending into North America is that called *Paspalum aureum* by Trinius.

Paspalum aureum H. B. K. Nov. Gen. & Sp. 1 : 93. 1816. Based on "*Axonopus* [misspelled *Axinopus*] *aureus* Beauv. agrost. p. 12." The species described and illustrated by Kunth (l. c. pl. 27) is *A. chrysoblepharis*.

Digitaria aurea Spreng. Syst. 1 : 272. 1825. Based on "*Paspalum aureum* Humb."

Paspalum exasperatum Nees, Agrost. Bras. 81. 1829. "Habitat ad margines sylvarum prope Ferradas provinciae Bahiensis, in via Felisbertiana, quae descendit e Minis." The type specimen was examined in the Munich Herbarium.

Panicum aureum Trin. Mém. Acad. St. Pétersb. VI. 3^2 : 196. 1834. Based on "*P*[*aspalum*] *aureum* Trin."

In North America this species also is known only from Costa Rica. In the National Herbarium are the following: *Herb. instit. physico-geogr. nat. costaricensis* no. 3305, collected at Pacaca, by *Pittier;* no. 3683, collected at Buenos Aires by *Tonduz;* nos. 11003 and 11004, collected at Cañas Gordas by *Pittier*, the latter having an intermixture of *A. chrysoblepharis*.

Section Lappagopsis (Steud.).

Axonopus dissitiflorus (Trin.).

Paspalum dissitiflorum Trin. Gram. Pan. 92. 1826. "V. spp. Brasil. (Langsdorff.)" The type specimen was examined in the Trinius Herbarium.

Paspalus tener Nees, Agrost. Bras. 32. 1829. This herbarium name is given as a synonym of *P. dissitiflorum* Trin.

This species is represented in the National Herbarium by *Glaziou* 15637, from Brazil.

Axonopus bijugus (Steud.).

Lappagopsis bijuga Steud. Syn. Pl. Glum. 1 : 112. 1854. (See above under *Lappagopsis.*)

This more delicate species with smaller spikelets is represented in the National Herbarium by the following, all from Brazil: *Burchell* 5886, 7703; *Gardner* 2978.

Two species described by Nees, *Paspalum canaliculatum* and *P. fastigiatum*, the types of which, both collected by Martius in Brazil, were examined in the Munich Herbarium, belong in this section but being insufficiently known are not here transferred.

15. Genus REIMAROCHLOA Hitchc.

Reimarochloa Hitchc. Contr. Nat. Herb. 12 : 198. 1909. "For *R*[*eimaria*] *acuta* and its allied species the above name is proposed with *Reimaria acuta* Flügge as the type: *Reimarochloa acuta* (Flügge)" Hitchc.

Fig. 7.
Reimarochloa acuta.
(Two views of spikelet and fruit x 10 diam.)

Besides the type, two other species are here included in this genus, *Reimarochloa brasiliensis* (Spreng.) Hitchc. and *Reimarochloa oligostachya* (Munro) Hitchc. For the discussion of *Reimaria* Flügge see this name under *Paspalum.*

Description.—Inflorescence of few to several slender racemes, approximate at the summit of the culm, spreading or reflexed at maturity; spikelets strongly dorsally compressed, lanceolate, acuminate, solitary, rather distant, subsessile and alternate in two rows along one side of a narrow, flattened rachis, the back of the fertile lemma turned toward it; both glumes wanting (or the second glume sometimes present in the terminal spikelet); sterile lemma about equaling the fruit, sterile palea obsolete; fruit scarcely indurated, the lemma faintly nerved, acuminate, the margins inrolled at the base only, the palea free nearly half its length. Stoloniferous perennials with linear leaves; a small genus of but few species confined to the tropics and subtropics of the western hemisphere.

The scarcely indurated, acuminate fruit, the margins of the lemma inrolled at the base only, the palea free for its upper half, and the absence of the glumes, taken in combination, together with the spreading or

reflexed racemes approximate at the summit of the culm, are here taken as the distinguishing characters of this genus.

Besides the species placed in this genus by Hitchcock (l. c.) a third South American species belongs in the genus, **Reimarochloa aberrans** (Doell), *Reimaria aberrans* Doell (Mart. Fl. Bras. 2^2 : 38. pl. 13. 1877) "Habitat prope Santarem provinciae Paraënsis (R. Spruce n. 851 et 887.)" The type specimen, *Spruce* 851, was examined in the Munich Herbarium. In this species the second glume is occasionally present on racemes with glumeless spikelets.

16. Genus PASPALUM L.

Paspalum L. Syst. Nat. ed. 10. 855. 1759. After a brief diagnosis four species are given, *P. dimidiatum*, *P. virgatum*, *P. paniculatum* and *P. distichum*. All agree with the diagnosis, though the last, with acute fruit, might be excluded from eligibility as type species because the generic diagnosis reads: "*Cor.* Gluma * * * obtusa." None of the species are figured in the same work, none are economic nor indigenous from the standpoint of the author. *Paspalum virgatum* and *P. paniculatum* are here first published, *P. dimidiatum* being the only one previously described. For this reason and also because it is the first species under the genus it is here taken as the type. This is given as follows: "*dimidiatum* A *P*[*aspalum*] spicis subsolitariis, pedunculo communi membranaceo. *Panicum dissectum sp. pl.* 57. *n.* 6." There is nothing to explain why Linnaeus changed the specific name. This is discussed by Hitchcock (Contr. Nat. Herb. 12 : 115–116. 1908) who examined in the Linnaean Herbarium the type specimen, upon the sheet of which Linnaeus wrote both "dimidiatum", which is crossed out, and "dissectum." The plant is also marked "K" which indicates that it was collected by Kalm. In the second edition of the Species Plantarum (page 81. 1762) Linnaeus corrects himself, giving the name *Paspalum dissectum* L. based upon "Panicum dissectum Sp. pl. 1. p. 57." (For a full discussion the reader is referred to Hitchcock's paper.) The specimen belongs to the species long known under the name *Paspalum membranaceum* Walt.

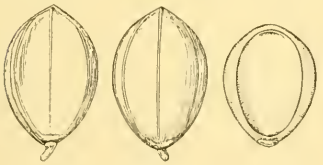

Fig. 8.
Paspalum dissectum.
(Two views of spikelet and fruit x 10 diam.)

The masculine form *Paspalus* was used by Flügge (Gram. Monog. 51–190. 1810) Roemer and Schultes (Syst. Veg. 2 : 290–317. 1817) and by Nees (Agrost. Bras. 18–82. 1829).

Digitaria Heist. in Fabr. Enum. Pl. Hort. Helm. 207. 1759. This name is given as follows: "Digitaria Heist. Dactylis Rai. Gramen dactylon majus panicula longa, spicis pluribus nudis crassis. Sloane." This phrase name in Sloane (Voy. Jam. 1 : 112. pl. 69. f. 2. 1707) refers to the species later published as *Paspalum virgatum* L., Sloane's specimen of which was examined in the herbarium of the British Museum. This phrase

name Linnaeus first cites (as the third synonym) under *Panicum dissectum* (Sp. Pl. 57. 1753), but erroneously, the plate being an illustration of a very different species from the type of *P. dissectum* in the Linnaean Herbarium.* Linnaeus later (Sp. Pl. ed. 2. 81. 1762) cites this phrase name and plate under *Paspalum virgatum* and also (op. cit. 1483), erroneously, under *Andropogon fasciculatum*. According to the American Code of Botanical Nomenclature (Canon 10) the publication of *Digitaria* Heist. as a genus would depend upon the specific description [from Sloane] "associable by citation with a previously published binomial species." While this specific description is cited under *Panicum dissectum* it is erroneously so; the species to which the description (as well as the figure) applies has no "previously published binomial," and therefore in the technical sense is not published.

Sabsab Adans. Fam. 2:31, 599. 1763. No species are given. The technical publication of the name is based upon the citation of "Paspalum. Lin."

Cleachne Roland. in Rottb. Acta Lit. Univ. Hafn. 1:285. 1778. The name "*Cleachne* R." appears to be given as a synonym of *Paspalum*, three unpublished names of the latter being mentioned without description.

Ceresia Pers. Syn. Pl. 1:85. 1805. A brief diagnosis is given and a single species *C. elegans* Pers. (l. c.) is cited. This name is based on "Paspalum membranaceum Lam. ill. gen. p. 177. t. 43. f. 2. Hab. in Peru." The generic diagnosis appears to be taken from Lamarck's specific description, but slightly rearranged. Lamarck's specimen has not been examined, but the description and figure indicate one of the species related to *Paspalum stellatum* Humb. & Bonpl. and probably that represented by Gardner's Plants of Brazil no. 4029 and Bang's Plantae Bolivianae no. 1080. Lamarck's name is preoccupied by Walter's use of *P. membranaceum*. Roemer & Schultes (Syst. Veg. 2:290. 1817) give *P. elegans*, based on *Ceresia elegans* Pers., as a synonym of *P. membranaceum* Lam., but this binomial also is preoccupied by *P. elegans* Flügge (Gram. Monog. 183. 1810); *P. commersonii* Zucc. (in Roem. Collect. 122. 1809), which appears to refer to this species, is preoccupied by Lamarck's use of the same name. It seems probable that this species has somewhere received a name that will prove tenable, but as yet we have not found it. Trinius and Doell use the name *P. membranaceum* Lam.

Reimaria Flügge. Gram. Monog. 213. 1810. The "character essentialis" given is as follows: "*Calix* uniglumis, unifloris, valvae planiori appressus. *Corolla* plano-convexa, bivalvis," to which is added the observation "Paspalo affinis, at satis superque differt calice constanter uniglumi nec biglumi." It will be seen that the absence of both glumes is the only character given to differentiate this proposed genus from *Paspalum*. Three species are included, *R. candida* Humb. & Bonpl., *R. elegans* and *R. acuta*, all here described for the first time. The first

* For an account of the types of American grasses described by Linnaeus see Hitchcock (Contr. Nat. Herb. 12:114-127. 1908).

two are species of *Paspalum* in which both glumes are wanting, the third has characters sufficiently distinct to be referred to a different genus. (See *Reimarochloa* Hitchc., of which *R. acuta* is the type.) Since the three species cited belong to two genera, it is necessary that the name *Reimaria* go with the larger group. (See Hitchcock, Contr. Nat. Herb. 12 : 198. 1909.) Of these two species we take the first as the type species. This was described from a plant collected "Prope Puanbo in America meridionali. *Humboldt* et *Bonpland*." Flügge gives "Humboldt et Bonpland" as the authors of the species. Kunth later (Mem. Mus. Par. 2 : 68. 1815) transferred the specific name to *Paspalum*. A part of the type or a duplicate of it marked "ex Hb. Kunth & Hb. Humb." was examined in the Berlin Herbarium. It is the species distributed as *Paspalum candidum* H. B. K. by John Donnell Smith and by the Herb. Instit. physico-geogr. nat. costaricensis, and represented in the National Herbarium by *John Donnell Smith* 4992, *Tonduz* 8492 and several others collections from Costa Rica and Guatemala. Doell (Mart. Fl. Bras. 2^2 : 39. 1877) proposes a section *Eremachyrion* for the species of *Paspalum* in which both glumes are wanting.

Paspalanthium Desv. Opusc. 59. 1831. This genus, which is differentiated from *Paspalum* by the loose glume and sterile lemma exceeding the fruit and by the membranaceous rachis, includes a single species *P. stoloniferum* Desv., based on *Paspalum stoloniferum* Bosc. (Trans. Linn. Soc. 2 : 83. pl. 16. 1794 "H. in Perua"). The type specimen was examined in the Bosc Herbarium at Padua. It is the species frequently cultivated under this name, with thin, conspicuously rugose sterile lemma.

Moenchia Wender in Steud. Nom. Bot. ed. 2. 2 : 153. 1841, not Roth. 1788. There is no description and a single nomen nudum, *M. speciosa* Wender, is given as a synonym of *Panicum saccharoides* Kunth, upon which is based *Paspalum saccharoides* Nees.

Anachyris Nees, in Hook. Kew Journ. 2 : 103. 1850. A single species, *A. paspaloides* Nees "In Brasilia. *Gardner*, n. 4031 *in herb.* Lindl.," is included. A portion of a raceme from the type specimen was kindly sent by the herbarium at the University of Cambridge for deposit in the National Herbarium. The species is of that small group including *Paspalum malacophyllum* Trin. and *P. elongatum* Griseb., in which both glumes are wanting and in which the very convex fertile lemma is longitudinally grooved. This accounts for the mistake made by Nees in placing the proposed genus in *Oryzeae*. In this group the fruit is rather readily detached from the spikelet leaving the thin sterile lemma attached to the rachis. It must have been such a fruit, mistaken for the entire spikelet, that Nees had before him when he described the genus.

Steudel (Syn. Pl. Glum. 1 : 33. 1854) spells this name *Anachyrium*.

Maizilla Schlecht. Bot. Zeit. 8 : 601, 605. 1850. A single species is given, "*M. stolonifera* Bosc. sub *Paspalo*."

Cymatochloa Schlecht. Bot. Zeit. 12 : 817, 821. 1854. Two species, "*C. fluitans* N[o]b. (*Ceresia fluitans* Ell. * * *)" and "*C. repens*

Nb. (*Paspalum repens* Berg.)," are included, the first of which is here taken as the type.

Dimorphostachys Fourn. Compt. Rend. Acad. Sci. Paris. 80 : 441. 1875. This genus is proposed because of the presence of the first glume of the spikelet, this glume in the lower of the pair of spikelets being larger than in the upper. The author says the group contains eleven species, but four of which he mentions, *Panicum monostachyum* H. B. K. *Paspalum pilosum* Lam., *Paspalum oajacense* Stend., and *Paspalum pedunculatum* Poir. Fournier does not here actually transfer any species to *Dimorphostachys*. His first named species, which we take as the type, was, together with the others given in his posthumous work (Mex. Pl. 2 : 14–16. 1886*), published under this genus by Hemsley (Biol. Centr. Amer. Bot. 3 : 499. 1885), as *D. monostachya* Fourn., based on *Panicum monostachyum* H. B. K.

The section *Harpostachys* of Panicum established by Trinius (Mém. Acad. Pétersb. VI. Sci. Nat. 3^2 : 227. 1834) for species having a simple, solitary raceme, if typified by the first group of species included in it, *Panicum decumbens* Roem. & Schult. (based on *Paspalum decumbens* Sw., of which *P. pedunculatum* Poir. is a synonym) and *Panicum monostachyum* H. B. K., is synonymous with *Dimorphostachys*. In this section, however, Trinius included a number of remote species, the wholly artificial character on which it is based bringing together, besides the two species of *Paspalum* mentioned above, *Thrasya paspaloides* H. B. K. and congeners; *Panicum repandum* Nees, a species related to *P. obtusum* H. B. K., *Echinolaena hirta*, and *Panicum sclerochloa* Trin. and other species referable to *Mesosetum*.

Wirtgenia Nees; Doell in Mart. Fl. Bras. 2^2 : 40. 1877. "*Wirtgenia paspaloides* Nees ab Esenb. in herb. Reg. Berolin.", a herbarium name for the species Nees published as *Anachyris paspaloides*, is here given as a synonym of *Paspalum malacophyllum* Trin.

The relationship of the various species upon which are based the proposed genera here included as synonyms of *Paspalum* together with the history of these groups will be discussed in the projected revision of North American species of Paspalum.

Description.—Inflorescence of 1 to numerous, simple, spike-like racemes, along a common axis; spikelets plano-convex, usually obtuse, subsessile (rarely on pedicels as long as the spikelets) solitary or in pairs, in two rows on one side of a narrow or dilated rachis, the back of the fertile lemma turned toward it;† first glume typically wanting (regularly present in a few species, occasionally present in others; in a few species both glumes wanting); second glume and sterile lemma subequal, the glume rarely shorter; fruit usually obtuse, the lemma and palea chartaceous-indurated (rarely but slightly so), the margins of the lemma inrolled.

* For discussion of date of this work see Hitchcock & Chase, Contr. Nat. Herb. 15 : 49. 1910.

† Owing to a tortion of the short pedicels the crowded, paired spikelets are often turned edgewise to the rachis or even entirely reversed, but in all species examined the spikelet is attached with the back of its fertile lemma toward the rachis.

Mostly perennials, of various habit; a large genus of the tropics and warm temperate regions of both hemispheres, but the species much more numerous in the western hemisphere.

The characters here considered as of chief generic value are the strictly racemose inflorescence, the plano-convex (sometimes slightly concavo-convex) spikelets in which the first glume is wanting, and the obtuse, indurated fruit, the margins of the lemma inrolled, taken in combination. But in this large, on the whole well-marked genus, there are many species which depart more or less from some one or two of these characters.

17. Genus PANICUM L.

Panicum L. Sp. Pl. 55. 1753. This genus is discussed by Hitchcock & Chase (Contr. Nat. Herb. 15 : 11–18. 1910) and the type species shown to be *Panicum miliaceum* L. The generic names included as synonyms under *Panicum*, so far as these are based on North American species, are there accounted for. The genus in relation to the South American and Old World species upon which genera have been proposed will be discussed in a later paper. In the above mentioned work, under the genera excluded from *Panicum* (op. cit. 16), is given *Panicum tuerckheimii* Hack., "an anomalous species with spikelets in which the first glume is wholly wanting, and in which no rudiment of a palea is found in the sterile lemma." This statement is found to be partly erroneous. There is present a small hyaline first glume, so transparent as to be invisible in the dry spikelet, which escaped the notice of Hackel and of ourselves. This species, though unique, we now include in the genus *Panicum*. It will be described and the spikelet figured in a forthcoming paper (by Hitchcock & Chase) on the Mexican and Central American species of *Panicum*, a supplement to the recent revision of the genus.

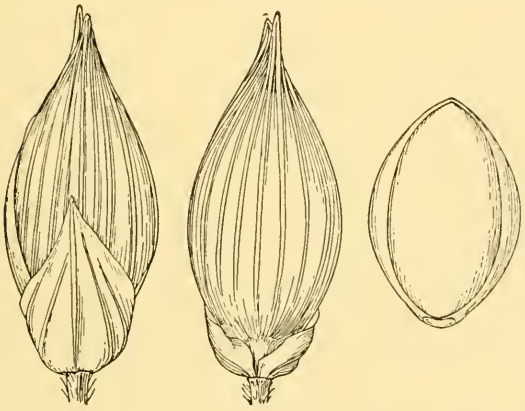

Fig. 9.
Panicum miliaceum.
(Two views of spikelet and fruit x 10 diam.)

Chasea Nieuwl. Amer. Midl. Nat. 2 : 63, 64. 1911. This name is proposed as "nov. nom. *Panicum* of the authors not of Linnaeus or only

in part." The author states that he "restores" the "name *Panicum* to the group of plants to which it was applied as far back as nearly two thousand years ago," overlooking Bubani's restoration of the same name to the same group in 1901 (Fl. Pyren. 4 : 261) and the fact that Adanson, Miller and Moench, applied the name *Panicum* in the same way. As shown in the revision of North American Species of *Panicum* (Hitchcock & Chase, Contr. Nat. Herb. 15 : 13. 1910) "the historic type species of Panicum is *Chaetochloa italica*", and the pre-Linnæan name for the genus containing *Panicum miliaceum* is Milium. Nieuwland, while maintaining *Panicum* for the pre-Linnæan genus of this name, overlooks *Milium* Tourn., the historic name of the genus containing *Panicum miliaceum*, and also the post-Linnæan *Urochloa* Beauv. (Ess. Agrost. 52. pl. 11. f. 1. 1812.) based on *U. panicoides* Beauv., which is the same as *Panicum helopus* Trin., an Old World species of the *Fasciculata* group of *Panicum*; *Thalasium* Spreng. (Syst. Veg. 4 : cur. post. 30. 1827), based on a South American species allied to *Panicum urvilleanum* Kunth; *Steinchisma** Raf. 1827; *Eriolytrum* Desv. in Kunth (Rév. Gram. 2 : 217. 1830), based on a South American specimen of *P. urvilleanum* or an allied species; and *Phanopyrum* Nash. The author (op. cit. 61) states that the "other group [*Panicum* L. excluding *Panicum italicum* and its congeners] has never to my knowledge received a name," and (op. cit. 63) that "This procedure leaves the other genus hitherto called *Panicum* by the authors, without a name, as far as I am able to ascertain, and I propose that of Chasea." Since this is proposed as a new name for "*Panicum* of the authors" and no particular authors are mentioned,† we take it as based upon *Panicum* as used by Beauvois (Ess. Agrost. 45, 169, 170, 171. 1812) who, besides recognizing *Paspalum* L., *Digitaria* Hall., *Cynodon* and *Pennisetum* Pers., segregates *Setaria* and *Echinochloa*, leaving in *Panicum* the remainder of the species included by Linnaeus under that genus, that is the group of *Panicum miliaceum* and its congeners.

18. Genus ICHNANTHUS Beauv.

Ichnanthus Beauv. Ess. Agrost. 56. pl. 12. f. 1. 1812. The genus is based on a single species, *I. panicoides* Beauv. (op. cit. 57), "croît dans l'Amérique méridionale: elle m'a été communiquée par M. Desfontaines." The generic description is erroneous in that Beauvois mistook the appendages at the base of the fruit for an abortive floret placed, he says, contrariwise to the other florets. (It was from this supposed abortive floret that Beauvois derived the name *Ichnanthus*.) We have not seen Beauvois' specimen. The figure, though slightly inaccurate, is a good illustration of the species well described and figured by Kunth (Rév. Gram. 2 : 245. pl. 34. 1830) under the name *Ichnanthus panicoides*.

* This and *Phanopyrum* are discussed in Contr. Nat. Herb. 15 : 18, 118, 327. 1910.

† It might be inferred from the name proposed that Hitchcock and Chase, authors of the North American Species of Panicum, were referred to, but this work is nowhere mentioned by Nieuwland, nor is the source of the proposed name given.

Navicularia Raddi, Agrost. Bras. 38. pl. 1. f. 5. 1823. Three species are included, *N. hirta*, *N. glabra* and *N. lanata* (op. cit. 40. pl. 1. f. 5). The last-named species, "Invenitur in herbidis prope *Rio-Inhumirim*", is here taken as the type since it is the only one of the three figured in the same work and because Raddi, in his generic description, refers to this figure. We have not seen Raddi's specimen, but from the description and figure we judge it to be the same as *Panicum leiocarpum* Spreng. (*Ichnanthus leiocarpus* (Spreng.) Kunth), to which Nees (Agrost. Bras. 147. 1829) refers it, or a closely allied species. Raddi proposes the genus because of the peculiar calyx-like structure which is borne on the hermaphrodite floret.

Fig. 10.
Ichnanthus panicoides.
(Spikelet and fruit x 7½ diam.)

The genus *Ichnanthus* has been recognized by some authors as valid and by others has been included in *Panicum*. Trinius at first (Fund. Agrost. 130. 1820) accepts *Ichnanthus*, even to the "transverse" abortive floret, but later (Gram. Pan. 52, 53. 1826) he includes it in his *Panicum*, section *Jubaria*, with the observation that it is included in *Panicum*, having, like "*Pan. almadense, pseudagrostis, Hofmanseggii, melicarium*", a hermaphrodite floret appendiculate at the base with a double rudiment.

Nees (Agrost. Bras. 149. 1829) includes *Ichnanthus panicoides*, which he here renames *Panicum ichnanthum*, in *Panicum*, section *Virgata*, placing it next after *Panicum leiocarpum* and *P. Hoffmannseggii*, species now recognized as belonging in *Ichnanthus*. Nees describes the perfect floret as being embraced at the base by an ovate, appressed, papery, two-parted lamina.

Kunth (Rév. Gram. 1 : 41. 1829) accepts the genus *Ichnanthus* with the single original species, and describes the fertile lemma as bearing at the base oblique-oblong, obtuse, glabrous scales decurrent on the pedicel. Later (op. cit. 2 : 245. 1830), while still including but the single species, Kunth, in his observations, states that the supposed hypogynous scales of authors are analogous to the lodicules which are ordinarily found only at the base of the interior palet (palea) but are here found also and greatly developed, on the exterior palet (lemma). In a later part of the same work (op. cit. 2 : 508. pl. 168. 1831) he transfers to *Ichnanthus Panicum leiocarpum* Spreng., a species in which the appendages are prominent. Still maintaining the genus solely on account of the appendages at the base of the perfect floret, Kunth (Enum. Pl. 1 : 135. 1833) adds *Panicum almadense* Nees to *Ichnanthus*.

Trinius (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 195, 320. 1834) makes *Ichnanthus* (spelling it "*Ichnantus*") a section of *Panicum*, with the synoptical heading "Flosculus * * * hermaphroditus basi faciei utrinque canaliculato-scrobiculatus vel (plerumque) auriculato appendiculatus," thus indicating the group as to-day accepted, including species in which there is a scar or excavation at base as well as those having appendages.

Steudel (Syn. Pl. Glum. 1 : 93. 1854) follows Trinius.

Bentham (Fl. Hongkong. 413. 1861) adopts *Ichnanthus* as a genus in this emended sense, including in it *I. pallens* (Sw.) Munro.

Grisebach (Fl. Brit. W. Ind. 550. 1864) gives it, in the same sense, as a section of *Panicum*.

Doell (Mart. Fl. Bras. 2^2 : 276. 1877) maintains *Ichnanthus* as a genus for the group segregated as *Panicum*, section *Ichnanthus* by Trinius, making under it two divisions "I Valvula inferior ad basin utrinque auriculatus" and "II Valvula inferior ad basin utrinque scrobiculata."

Bentham (Benth. & Hook. Gen. Pl. 3 : 1103. 1883) and Hackel (Engler & Prantl, Pflanzenf. 2^2 : 36. 1887) maintain *Ichnanthus* as a genus for this larger group.

(Schultes, Mant. 2 : 281. 1824, misspells the name "Ischnanthus.")

Description.—Inflorescence paniculate, the spikelets mostly short-pediceled along the usually sub-simple branches; spikelets more or less laterally compressed, the glumes and sterile lemma strongly nerved; first glume usually more than half the length of the spikelet, broad, acute; second glume and sterile lemma subequal, acute, exceeding the fruit, the lemma enclosing a membranaceous palea and rarely a staminate flower; fruit acute or subacute, indurated, the margins of the lemma usually flat, the rachilla produced below the lemma into a usually minute stipe, this bearing on either side membranaceous appendages adnate to the base of the lemma and free above, the appendages sometimes wanting and indicated by minute excavations only. Perennials, usually with lanceolate blades abruptly contracted into a petiole-like base; the genus mostly confined to the tropics of the western hemisphere, one species extending into the Old World.

Ichnanthus is closely allied to *Panicum* and appears to be but a loosely coherent genus, several of the species differing from each other almost as much as some of them differ from species of *Panicum*. A few species, such as *I. lanceolatus* Scribn., in which the appendages are wholly wanting and even the scars obscure (but in which the lemma margins are flat), are nearly as referable to one genus as to the other.

19. Genus LASIACIS (Griseb.) Hitchc.

Lasiacis Hitchc. Contr. Nat. Herb. 15 : 16. 1910. "The type of the genus is *Lasiacis divaricata* (L.) Hitchc., based on *Panicum divaricatum*

L., the type of Grisebach's section." The author raises *Panicum*, section *Lasiacis* Griseb. (Fl. Brit. W. Ind. 551. 1864) to generic rank. The type specimen of *Panicum divaricatum* L. (Syst. Nat. ed. 10. 2 : 871. 1759) was examined in the Linnaean Herbarium. It was collected by Browne in Jamaica.

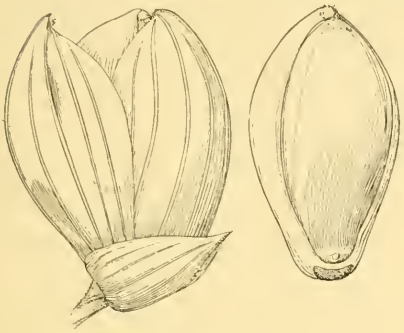

Fig. 11.
Lasiacis divaricata.
(Spikelet and fruit x 10 diam.)

Description.—Inflorescence of open, rarely compact, panicles at the ends of the culm and branches; spikelets subglobose, placed obliquely on their pedicels, the glumes and sterile lemma broad, abruptly apiculate, papery-chartaceous, shining, many nerved, glabrous, or lanose at the apex only, the first glume rarely over ⅓ the length of the spikelet, somewhat inflated-ventricose, the second glume and sterile lemma subequal or the glume slightly shorter, the lemma enclosing a membranaceous palea and sometimes a staminate flower; fruit white, bony-indurated, obovoid, obtuse, both lemma and palea bearing at the apex in a slight crateriform excavation, a tuft of woolly hairs, the palea concave below, gibbous above, the apex often free at maturity. Large perennials, usually with freely branching, woody culms, often forming tall half-shrubs; leaf-blades firm, often narrowed to a petiole-like base; a genus of some fifteen species confined to the tropics and subtropics of the western hemisphere.

This genus is unusually well marked, the spikelets particularly of all the species being strikingly similar.

Besides the species placed in this genus by Hitchcock (Contr. Nat. Herb. 15 : 16. 1910 and Bot. Gaz. 51 : 301, 302. 1911) the following North American species, taken from the manuscript revision of the genus *Lasiacis*, are here transferred :

Lasiacis liebmanniana (Fourn.) Hitchc.
Panicum liebmannianum Fourn. Mex. Pl. 2 : 33. 1886.

Lasiacis oaxacensis (Steud.) Hitchc.
Panicum oaxacense Steud. Syn. Pl. Glum. 1 : 73. 1854.

Lasiacis ruscifolia (H. B. K.) Hitchc.
Panicum ruscifolium H. B. K. Nov. Gen. & Sp. 1 : 110. 1816.

Lasiacis rhizophora (Fourn.) Hitchc.
Panicum rhizophorum Fourn. Mex. Pl. 2 : 31. 1886.

Lasiacis procerrima (Hack.) Hitchc.
Panicum procerrimum Hack. Oesterr. Bot. Zeitschr. 51 : 431. 1901.

20. Genus SACCIOLEPIS Nash.*

Sacciolepis Nash in Britton, Man. 89. 1901. Based on a single species, *S. gibba* (Ell.) Nash, which is the same species as *Holcus striatus* L., the latter name being later transferred to *Sacciolepis* by Nash to replace *S. gibba*.

21. Genus HYMENACHNE Beauv.

Hymenachne Beauv. Ess. Agrost. 48. t. 10. f. 8. 1812. The type species is *Agrostis monostachya* Poir., which is the same as *H. amplexicaulis* (Rudge) Nees.

22. Genus HOMOLEPIS gen. nov.

Inflorescentia paniculata; spiculae majusculae subfusiformes; glumae subaequales vel prima paulum longior, 7–9 nerviae, flosculos (et sterilem et fertilem) occultantes; lemma sterile vix glumis aequilongum, latius fertili idque amplectens et paleam angustam hyalinam includens atque interdum florem cum staminibus; fructus ellipticus acutus laevis nitidus; lemmate paleaque quam in *Panico* minus induratis, lemmatis marginibus planis.

Herbae perennes, stoloniferae, nodis radicantes; culmae floriferae basi plus minusve decumbentes.

Nomen a ὅμοιος *similis*, et λεπίς *squama*.

Inflorescence paniculate; spikelets rather large, subfusiform; first and second glume equal or the first slightly the longer, 7- to 9-nerved, the pair wholly covering the sterile and fertile florets; sterile lemma nearly as long as the glumes, broad, enfolding the fertile lemma, and enclosing a narrow hyaline palea and sometimes a staminate flower; fruit elliptic, pointed, smooth and shining, the lemma and palea less indurated than in *Panicum*, the margins of the lemma flat.

Perennials, sending out long leafy runners, rooting at the nodes, the flowering culms more or less decumbent at base. Confined to the tropics of the western hemisphere. Name from ὅμοιος, alike, and λεπίς, scale.

Type *Panicum aturense* H. B. K.

Homolepis aturensis (H. B. K.)

Panicum aturense H. B. K. Nov. Gen. & Sp. 1 : 103. pl. 33. 1816. "Crescit ad cataractas Aturensis." The type specimen, in the Bonpland Herbarium in the Muséum d'Histoire Naturelle at Paris, consists of a simple flowering culm, decumbent at base. The label bears the name and data as published.

Panicum viridiflorum Nees, Agrost. Bras. 135. 1829. Habitat unknown to Nees. The type specimen in the Berlin Herbarium is labeled "Hb. Nees. Panicum viridiflorum. Panicum aturense Kth.," followed by a diagnosis. Nees distinguishes his plant from *P. aturense* by the 7- to 9-nerved glumes and sterile lemma, these being erroneously described by Kunth as 3-nerved.

* This and the following genus were discussed and the spikelets of the type species figured in Proc. Biol. Soc. Wash. 21 : 1–10. 1908; only a summary is here given.

Panicum blepharophorum Presl, Rel. Haenk. 1 : 312. 1830. "Hab. in Mexico." The type specimen is in Presl's Herbarium in the Bohemian National Museum at Prague.

Panicum tumescens Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 316. 1834. No locality other than Brazil is given. In the Trinius Herbarium is a specimen collected by Riedel in Bahia, Brazil, in 1831, marked by Trinius "Panicum tumescens m.," which is no doubt the type.

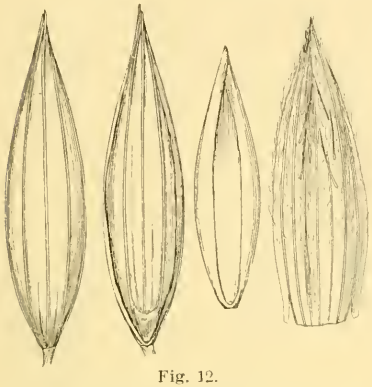

Fig. 12.
Homolepis aturensis.
(Two views of spikelet, fruit and sterile lemma x $6\frac{2}{3}$ diam.)

Milium orinocoense Willd.; Steud. Nom. Bot. ed. 2. 2 : 146. 1841. This is given as a synonym of *Panicum aturense* H. B. K.

Homolepis isocalycina (Meyer).

Panicum isocalycinum Meyer, Prim. Fl. Essequ. 59. 1818. "In arenosis umbrosis continentis" Essequibo [British Guiana]. A specimen of this sent by Meyer was examined in the Trinius Herbarium.

Panicum Langei Fourn. Mex. Pl. 2 : 23. 1886. "*Teotalcingo* (Liebm. n. 435. junio)." The type specimen is in the herbarium of the Botanical Garden of the University at Copenhagen.

In the National Herbarium there is a specimen of *H. isocalycina* collected by Salzmann in Bahia, Brazil, and distributed without number, as "Panicum zizanioides H. B. K." It is distinguished from *H. aturensis* by the slightly shorter, more turgid spikelets, with a glabrous sterile lemma and more indurated fruit.

Homolepis longispicula (Doell).

Panicum longiflorum Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 317. 1834, not Gmel. 1796. No locality other than Brazil is given. In the Trinius Herbarium is a packet of spikelets marked "Panicum longiflorum m. Brasil," and a specimen bearing the same name and also "no. 147. Lect.—?"

Panicum longispiculum Doell in Mart. Fl. Bras. 2^2 : 261. 1877. "Habitat in Brasilia, loco accuratius non adnotato (herb. Acad. Petropolit.)." Doell cites "*Paspalum longiflorum* Trinius in Act. Petrop. 1835. p. 307 non Gmelin Syst. Veg. I. 158." This must be an error for *Panicum* since there is no *Paspalum longiflorum* of Trinius nor of Gmelin. The page reference is also erroneous. Evidently Doell's name is a typonym of *Panicum longiflorum* Trin.

Ichnanthus longiflorus Benth. Journ. Linn. Soc. Bot. 19 : 45. 1881. This is based on "*Panicum longiflorum* Trin"., though from his statement that "in *I. longiflora* (*Panicum longiflorum*, Trin.) they [the auricles] are very

small, but prominent'' it seems probable that Bentham had some other species under this name. The fertile lemmas in the spikelets of this species in the Trinius Herbarium are not at all auricled nor are the spikelets, with their villous-margined second glumes and villous sterile lemmas, suggestive of *Ichnanthus.* Both Trinius and Doell note the affinity of this species to *Panicum aturense.*

Homolepis longispicula differs from both the other species of this genus in having a densely silky-villous margin to the second glume, and a staminate flower in the first floret. The sterile (or staminate) lemma is densely villous, the fruit but little indurated as in *H. aturensis.* The only collection of this of which we know other than that in the Trinius Herbarium is *Glaziou* 22470 from Brazil.

23. Genus SCUTACHNE Hitchc. & Chase gen. nov.

Inflorescentia paniculata; spiculae breviter pedicellatae secus paniculae ramos teneros subsimplices dispositae, fusiformes, acuminatae, basi attenuatae, rachilla cum internodiis elongatis; gluma prima internodio rachillae imo stipitiformi adnata, quam spicula dimidio brevior, membranacea, marginibus basin versus connatis; gluma secunda lemmaque sterile subaequilongae, internodio rachillae manifesto separata, coriacea indurata fusca, 5-nervia; lemma sterile palea et interdum staminibus praeditum; fructus quam gluma secunda lemmateque sterili, vix induratior, circumscriptione elliptieus, lemmate in mueronem pubescentem abrupte angustato, marginibus basin versus leviter involutis, sursum planis pubescentibus, parte paleae summa haud inclusa, margine dense pubescente.

Herbae perennes, tenues, culmis simplicibus, laminis linearibus, planis, et paniculis angustis.

Nomen a σκύτος *corium* vel *pellis*, et ἄχνη *palea.*

Inflorescence paniculate, the spikelets short-pediceled along the slender, simple or nearly simple branches; spikelets fusiform, acuminate, the base attenuate, the internodes of the rachilla elongated, the lowermost forming a stipe, the first glume adnate to it; first glume membranaceous, about half the length of the spikelet, broad, the margins connate below; second glume and sterile lemma subequal, a manifest internode of the rachilla between them, leathery-indurated, brown or brownish, 5-nerved, the lemma enclosing a palea of similar texture, (and in the type species a staminate flower); fruit but slightly more indurated than the second glume and sterile lemma, elliptical in outline, the lemma abruptly acuminate into a slender, densely pubescent tip, the margins slightly inrolled below, membranaceous, flat and pubescent above, the summit of the palea not enclosed, densely pubescent on the margin.

Slender perennials, with simple culms, linear, flat leaves and narrow panicles; known only from Cuba. Name from σκύτος, leather and ἀχνη, scale.

Type *Panicum durum* Griseb.

Scutachne differs from other genera of this tribe in having a second

glume and sterile lemma leathery-indurated and nearly as firm as the fruit. *Bluffia eckloniana* Nees (which is referable to *Alloteropsis*) and *Alloteropsis semialata* (R. Br.) Hitchc., especially the first, have sterile lemmas subindurated like their fruits but the two glumes are similar. The subindurated, mucronate fruit, the lemma margins membranaceous and flat above, the palea free at the summit, further differentiate *Scutachne* from *Panicum*.

Scutachne dura (Griseb.) Hitchc. & Chase.

Panicum durum Griseb. Mem. Amer. Acad. n. ser. 8 : 533. 1862. This was published in Plantae Wrightianae e Cuba orientali; the only citation given is "(1539)." The type specimen is in the Grisebach Herbarium.

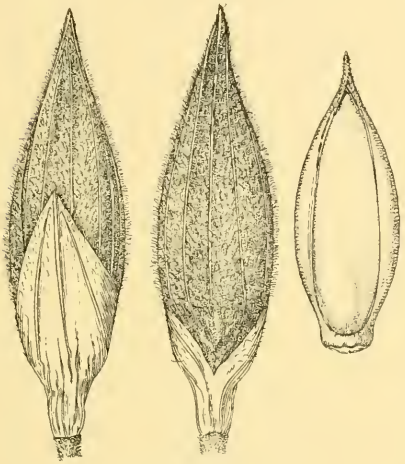

Fig. 13.
Scutachne dura.
(Two views of spikelet and fruit x 10 diam.)

Scutachne amphistemon (Wright) Hitchc. & Chase.

Panicum amphistemon Wright, Anal. Acad. Cienc. Habana 8 : 207. 1871. "Cerra de Mayarí abajo. [3464]." The type specimen, collected by Wright, in the Gray Herbarium, is labeled "Mayarí-abajo, Aug. 2, in small dense tufts."

These two species were placed in the genus *Alloteropsis* Presl by Hitchcock (Contr. Nat. Herb. 12 : 211. 1909) but further study has made this disposition of them appear an unnatural one. *Alloteropsis* is unique among the *Paniceae* in having a minute prolongation of the rachilla beyond the fertile palea. This is not present in all specimens of *A. semialata* examined, though it seems to be constant in *Bluffia eckloniana*, but its usual presence, together with the awn-tipped glumes and lemma, the glumes of like texture, indicate a relationship too remote from the Cuban species to justify retaining them in *Alloteropsis*.

24. Genus ISACHNE R. Br.

Isachne R. Br. Prod. Nov. Holl. 196. 1810. The genus is based on a single species, *I. australis* R. Br. collected by Brown in the vicinity of Port Jackson, Australia. The type has not been examined, but there is no reason to doubt that it is the common species of Australia and New Zealand, known under this name.

Isachne has usually been recognized as a valid genus ever since its pub-

lication. Sprengel (Syst. Veg. 1 : 314. 1825) describes a *Panicum antipodum* to which he refers *Isachne australis* R. Br. In his earlier works Trinius recognizes *Isachne* as a genus, but in his Panicearum Genera (Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 195, 328. 1834) he reduces it to a section of *Panicum*, and is followed by Steudel (Syn. Pl. Glum. 1 : 94. 1854).

Nees (Agrost. Bras. 96. 1829) gives "Isachne R. Br." as a synonym under the genus *Panicum*. But it is to be noted that the only species of *Isachne* Nees had in his Agrostologia Brasiliensis was the anomalous *Panicum trachyspermum* Nees, which is an exception to the genus in that the lower floret is unlike the upper. Nees later (Seeman, Bot. Voy. Herald 224. 1857) places this species in *Isachne*.

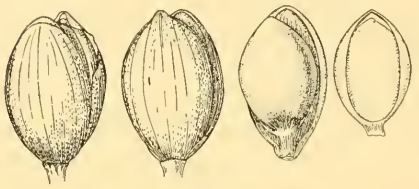

Fig. 14.
Isachne australis.
(Two views of spikelet, florets with glumes removed, and upper fruit x 10 diam.)

Kunth and Bentham give *Isachne* generic rank, as do Doell, Grisebach and Hooker. Bentham (Fl. Austr. 7 : 624. 1878) places the genus (instead of in *Paniceae* as did all other authors) in his tribe "VI *Astreptae*, subtribe *Milieae*," together with *Sporobolus*, *Micraira*, and others, *Paniceae* being his first tribe. This disposition of the genus appears to have been based on what Bentham in the Genera Plantarum (3 : 1077, 1100) calls the subarticulated, persistent glumes, since in his introduction to the *Gramineae* in the "Flora Australiensis" Bentham, emphasizing the importance in classification of the articulation of the spikelet, remarks that this character "settles the position of a few genera, *Polypogon*, *Milium*, *Isachne* etc. which might at first sight appear closely to connect the two great series." Later (Linn. Soc. Journ. Bot. 19 : 92, 1881) he proposes a "Tribe IX Isachnæ" with the statement that this is a modification of the subtribe proposed in the "Flora Australiensis" under the name *Milieæ*. *Milium* and *Sporobolus* are not here included. The tribe is placed between "Agrosteæ" and "Aveneæ" and includes *Prionachne*, *Isachne*, *Zenkeria*, *Coelachne*, *Airopsis*, *Micraira* and *Eriachne*, all except *Isachne* to-day included in *Aveneæ*. Bentham notes the resemblance of *Isachne* to some species of *Panicum* but adds that the "species of *Isachne* * * constantly differ in the empty glumes persistent below the articulation, and in the two flowers both hermaphrodite or female, though one may be occasionally sterile." Hooker (Fl. Brit. Ind. 7 : 2, 21. 1896) says that the first and second glumes are separately deciduous and that the fourth glume (lemma of upper floret) is articulate on the rachilla. Hackel (Engler & Prantl, Pflanzenf. 2^2 : 35. 1887) in the diagnosis of *Isachne* says, "the fruiting glumes falling out of the persistent empty glumes." The examination of a large number of specimens scarcely verifies these statements. While the articulation below the glumes is not constant as in other genera of *Paniceae*, the spikelets appear to fall entire in at least about half the cases. The glumes appear

to be commonly separately deciduous, as stated by Hooker, the pair of florets joined together, being found persistent in mature panicles after one or both glumes have fallen. A number of specimens show persistent glumes from which the florets have fallen, but these are much fewer than the persistent florets from which the glumes have fallen. Several panicles have been found in which both of these occur, but in the great majority of cases the spikelets are either present entire, or wholly fallen—though the parts may have fallen separately. The second floret articulate on the rachilla, falling separately, appears from the examination of our specimens to occur only very rarely, and then only when the lower floret is staminate, or at least not perfecting a grain. It may here be noted that in *Panicum capillare* and its close allies the fruit frequently falls from the temporarily persistent glumes and sterile lemma, and that occasionally in *P. dichotomum* and its allies the glumes and sterile lemma fall, leaving the fruit for a short time persistent.

Bentham later (Benth. & Hook. Gen. Pl. 3 : 1077. 1883) places *Isachne* in the tribe *Paniceae*, immediately before *Panicum*, and Hackel (Engler & Prantl, Pflanzenf. 2^2 : 33, 35. 1887) also assigns it to this position.

Description.—Inflorescence paniculate; spikelets obovoid to subglobose; glumes membranaceous, subequal, about as long as the fruits or at maturity exceeded by these; lower floret perfect or staminate, its lemma and palea indurated and similar in form and texture to those of the upper floret (scarcely indurated and dissimilar in *I. trachysperma* Nees); both florets (or fruits) plano-convex, obtuse, equal or nearly equal in size (the lower often larger when staminate only), the pair usually remaining attached together by the minute rachilla joint below the upper floret. Perennials with simple or branching culms and flat blades, the species confined to the tropics and warm temperate regions of both hemispheres.

The lower floret often appears to be sterile (not perfecting a grain) in some and fertile in other spikelets on the same panicle. When sterile the floret is often longer and the lemma less convex than when fertile, the spikelets on the same panicle thus having a somewhat diverse appearance.

Several species of *Isachne* bear a superficial though striking resemblance to species of the North American *Panicum*, subgenus *Dichanthelium*.

25. Genus HETERANTHOECIA Stapf.

Heteranthoecia Stapf in Hook. Icon. Pl. 30^2 : pl. 2927. 1911. The genus is based on a single species, *H. isachnoides* Stapf (l. c.) collected in "Tropical Africa: Northern Nigeria; Nupe, in swamps *Barter*, 1348: French Congo; Snussi Country (Chari oriental), at the sources of the Ndelle River, *Chevalier*, 6825." It is not stated from which collection the illustration was made. The genus differs from *Isachne* in having a racemose panicle, the subsessile spikelets in short racemes, these arranged along a common axis, and in having florets with lemmas dissimilar in form and texture, though both fertile. Stapf considers the genus intermediate between *Isachne* and *Coelachne*, the latter an anomalous genus of the Old World at present placed in *Aveneae*.

26. Genus OPLISMENUS Beauv.

Oplismenus Beauv. Fl. d'Oware et Benin. 2 : 14. pl. 58. f. 1. 1809.* Under the genus is described a single species, *O. africanus* (op. cit. 15), of which Beauvois says "J'ai trouvé cette espèce à Chamo, à Koto, à Oware et à Benin." He states that the genus is composed of several species of *Panicum* and notably those of which Persoon has made a division thus characterized: "*Spica composita, spiculis compressis secundis.*" The species included by Persoon (Syn. Pl. 1 : 82. 1805) in this division are *Panicum hirtellum*, *P. setarium*, *P. bromoides*, *P. cespitosum*, *P. loliaceum*, *P. compositum* and *P. elatius*. The type specimen of *O. africanus* has not been examined. The accompanying figure is made from *Zenker & Staudt* 515, collected in Kamerun, Africa, which is included in the region visited by Beauvois. (The generic name is misspelled "Ophismenus" in Poir.; Lam. Encyc. Suppl. 4 : 271. 1816.)

Fig. 15.
Oplismenus africanus.
(Two views of spikelet and fruit x 10 diam.)

Orthopogon R. Br. Prodr. Nov. Holl. 194. 1810. Four species are given under the genus, *O. compositus*, based on "*Panicum compositum* L.," *O. aemulus*, *O. flaccidus*, *O. imbecillis*. None being figured in the same work and all being equally eligible the first is here taken as the type.

Cheeseman (Man. New Zeal. Fl. 849. 1906) refers *Hekaterosachne elatior* Steud. (from New Zealand), the type of the monotypic genus *Hekaterosachne* Steud., to *Oplismenus undulatifolius* Beauv. Dalla Torre and Harms (Gen. Siphonog. 14. 1900) also refer this name to *Oplismenus*. We have not seen Steudel's specimen. His description (Syn. Pl. Glum. 1 : 118. 1854) does not well agree with *Oplismenus*, though it is possible that his description is erroneous.

Hippagrostis (Rumph.) Kuntze, Rev. Gen. Pl. 2 : 776. 1891. Kuntze gives Rumpf as the author of the genus, with the date 1749. *Hippagrostis* Rumph. (Herb. Amb. 6 : 14. pl. 5. f. 3. 1750) is based on a single species, *H. amboinica* Rumph. (l. c.), which the plate shows to be a species of *Oplismenus*, probably *O. burmannii*. Since a binomial species is given under the genus, only the fact that "Botanical nomenclature is treated as beginning with the general application of binomial names of plants (Linnaeus' Species Plantarum, 1753)" † renders *Hippagrostis* invalid for our use. In the Index Universalis (Herb. Amb. Auctuarium, 1755) the name *Hippagrostis amboinica* is given with reference to the 1750 work. Perhaps this might constitute publication.

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* The title page is dated 1807. The date 1809 is taken on the authority of J. H. Barnhart as stated in a letter from G. V. Nash, to whom we are indebted for a transcript of pages 14 and 15 of the second volume of the Flore d'Oware.

† American Code of Botanical Nomenclature Part 1, principle 2.

Beauvois (Ess. Agrost. 54. 1812) amplifies his earlier generic description and transfers to the genus several species from *Panicum*. He places *Oplismenus* immediately after *Echinochloa*.

Kunth (H. B. K. Nov. Gen. & Sp. 1 : 106. 1816) recognizes *Oplismenus* as a genus, including under it as synonymous *Orthopogon* R. Br. and *Echinochloa* Beauv. The same is done in his later works (Rév. Gram. 1 : 43. 1829; Enum. Pl. 1 : 138. 1833).

Desvaux (Opusc. 81. 1831) follows Kunth, but also includes *Panicum semialatum* in the genus.

Trinius (Fund. Agrost. 181. 1820) recognizes *Orthopogon* R. Br. as a genus, referring *Oplismenus* to it as a synonym.

Raddi (Agrost. Bras. 40. 1823) recognizes *Oplismenus*.

Trinius (Gram. Pan. 51, 153. 1826; Mém. Acad. St. Pétersb. VI. Sci. Nat. 3^2 : 209. 1834) reduces *Orthopogon* to a section of *Panicum*.

Nees (Agrost. Bras. 255. 1829; Fl. Afr. Aust. 60. 1841 * gives *Oplismenus* generic rank.

Steudel (Syn. Pl. Glum. 1 : 44. 1854) follows Trinius in making *Orthopogon* a section of *Panicum* and giving *Oplismenus* as a synonym.

Hasskarl (Cat. Pl. Hort. Bogor. Alt. 16. 1844) and Schlechtendal (Linnaea 31 : 263. 1861) spell the generic name *Hoplismenus*.

Bentham (Fl. Hongkong 409, 411. 1861) includes *Oplismenus* in *Panicum*, but later (Fl. Austr. 7 : 491. 1878) he gives it (with *Orthopogon* as a synonym) generic rank "with the limits originally assigned to it by Beauvois and by Brown," that is excluding *Panicum crusgalli* and allies referred to it by Kunth.

Grisebach (Fl. Brit. W. Ind. 544. 1864) recognizes *Orthopogon* as a genus for the group thus circumscribed, and Doell (Mart. Fl. Bras. 2^2 : 144. 1877) includes *Orthopogon*, in the same sense, as a section of *Panicum*, giving *Oplismenus* as a synonym.

Bentham (Benth. & Hook. Gen. Pl. 3 : 1077, 1104. 1883) gives *Oplismenus* generic rank as does Hackel (Engler & Prantl, Pflanzenf. 2^2 : 33, 36. 1887).

Fournier (Mex. Pl. 2 : 37. 1886) maintains *Oplismenus* as emended by Kunth, that is, including *Echinochloa*.

Dalla Torre and Harms (Gen. Siphonog. 14. 1900) give the name *Paniculum* Ard. as a synonym of *Oplismenus*. The name "PANICULUM *undulatifolium*" occurs in Arduini (Animadv. Bot. Spec. 2 : 14. pl. 4. 1764), but the generic name is an error for *Panicum*. The name printed on the plate is *Panicum undulatifolium*.

Description.—Inflorescence of few to many unilateral racemes, approximate or distant along a common, often flexuous axis, the racemes bearing many crowded or subdistant spikelets, or sometimes very short and bearing a single cluster; spikelets terete or somewhat compressed laterally, subsessile, in pairs or solitary in two rows on one side of a narrow, scabrous or hairy rachis; glumes subequal, emarginate or 2-lobed (rarely entire), awned or mucronate from between the lobes; sterile lemma ex-

*The second edition of this work was published in 1853 with the title "Agrostographia Capensis." The pagination is the same in both.

ceeding the glumes and fruit, notched or entire, mucronate or short-awned, enclosing a hyaline palea; fruit elliptic, acute, the lemma very convex or boat-shaped, the firm margins clasping the lemma, not inrolled. Usually weak, freely branching, creeping or ascending annuals or perennials, with flat, thin, lanceolate blades, the species confined to the tropics and warm temperate regions of both hemispheres.

In this genus the awns are variable in length in the same species.

27. Genus ECHINOCHLOA Beauv.

Echinochloa Beauv. Ess. Agrost. 53. pl. 11. f. 2. 1812. The first of several species of *Panicum* listed under this genus, and in the index (page 161) transferred to it, and the one figured is *E. crusgalli* (L.) Beauv., which is taken as the type. This species is based on *Panicum crusgalli* L. (Sp. Pl. 56. 1753) "*Habitat* in Europæ, Virginiæ *cultis*." The only specimen in the Linnaean Herbarium to which Linnaeus has attached the name is one of the ordinary small form of this species.* This is marked "K" indicating that it was collected by Kalm in America.

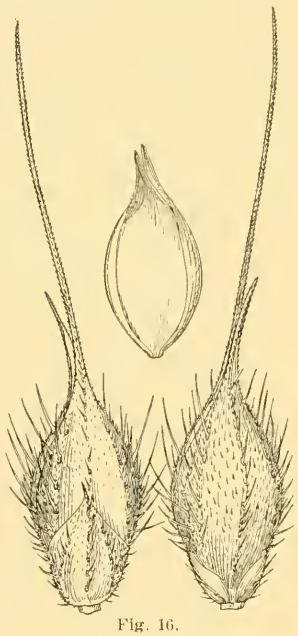

Fig. 16.
Echinochloa crusgalli.
(Two views of spikelet and fruit x 7½ diam.)

Adanson (Fam. Pl. 2 : 496. 1763) proposes a genus *Tema* with the differentiating diagnosis "Corolla obtuse or aristate on the exterior scale of the sterile flower." No binomial is cited. The authority for the genus is given as "H[ort.] M[alab] 12. t. 79" (which would indicate that Adanson adopts the genus from that work), and "Panicum Rumph. 5. t. 76. f. 2." and "Gramen paniceum spica divisa C. B." [Caspar Bauhin] are cited. The last citation refers to *Panicum crusgalli* L. and is also given by Linnaeus under that species (Sp. Pl. 56. 1753). The plant described and figured in Rheede (Hort. Malabar. 12 : pl. 79. 1703) is *Chaetochloa italica* (L.) Scribn. and the name there given it is *Tenna*, of which *Tema* would appear to be an erroneous transcript. The plant illustrated in Rumphius (Herb. Amb. 5 : pl. 76. f. 2. 1747) is *Eleusine indica*. If Adanson meant to unite these species in a single genus, as would appear to be the case, the name *Tema* would go with the first reference, and, since this is not associable with a previously published binomial the genus is not technically published. It is possible that the reference given to Rumphius is an error for plate 75, figure 2, this being an illustration of *Chaetochloa italica*.

* See Hitchcock, Contr. Nat. Herb. 12 : 117. 1908.

Trinius, Nees, and Steudel, of the earlier authors, include *Echinochloa*, usually as a section, in *Panicum*.

Kunth (H. B. K. Nov. Gen. & Sp. 1 : 106. 1816; Rév. Gram. 1 : 43. 1829; Enum. Pl. 1 : 138. 1833) and Desvaux (Opusc. 81. 1831) include it under *Oplismenus*.

Roemer & Schultes (Syst. Veg. 2 : 476. 1817), Schultes (Mant. 2 : 266. 1824), and Link (Hort. Berol. 2 : 208. 1833) give *Echinochloa* generic rank, but the latter adds (op. cit. 209) "Genera Echinochloa et Panicum artificialia sunt, nec natura distincta."

Of the later authors Bentham (Fl. Hongkong 411. 1861; Fl. Austr. 7 : 478. 1878; Benth. & Hook. Gen. Pl. 3 : 1102. 1883), Grisebach (Fl. Brit. W. Ind. 545. 1864), Doell (Mart. Fl. Bras. 2 ^{2} : 139. 1877) and Hackel (Engler & Prantl, Pflanzenf. 2 ^{2} : 35. 1887) include *Echinochloa* in *Panicum*. Fournier (Mex. Pl. 2 : 39. 1886) includes *E. crusgalli* and its close allies in *Oplismenus*, but *Oplismenus holciformis* H. B. K., a long-awned species allied to *E. spectabilis* (Nees) Link, he places in *Berchtoldia* (misspelled "*Berchtholdia*"). In his key to *Paniceae* (op. cit. 3) Fournier distinguishes *Berchtoldia* from *Oplismenus* by the "remote inferior glume." (Both genera are included under "Spiculis involucratis; involucro constante e spiculis abortivis," as opposed to "e chaetocladis" including *Setaria*, *Pennisetum*, etc. What Fournier could have mistaken for an involucre of abortive spikelets is not evident.)

Nash (Britton, Man. 78. 1901; Small, Fl. Southeast. U. S. 84. 1903) and Hitchcock (Gray, Man. ed. 7. 117. 1908) recognize *Echinochloa* as a valid genus.

Description.—Inflorescence paniculate, the usually compact, densely flowered panicle composed of one-sided simple racemes or of subsimple branches; spikelets plano-convex, often spiny-hispid, subsessile, solitary or in irregular clusters on one side of the panicle branches; first glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned, the lemma long-awned, in some species conspicuously so, enclosing a membranaceous palea and sometimes a staminate flower; fruit plano-convex, the lemma and palea smooth and shining, acuminate-pointed, the lemma margins inrolled below, flat above, the apex of the palea not enclosed. Coarse, often succulent annuals, with compressed sheaths and linear, flat blades; species of the temperate and tropical regions, two species cosmopolitan.

In this genus the awn of the sterile lemma is exceedingly variable in length, sometimes even in the same plant. *Echinochloa* is distinguished from *Panicum* constantly by the plano-convex, pointed fruit, the lemma margins flat above, the apex of the palea free, and usually by the awned sterile lemma.

A Mexican species described under *Oplismenus* belongs to this genus:

Echinochloa holciformis (H. B. K.).

Oplismenus holciformis H. B. K. Nov. Gen. & Sp. 1 : 107. 1816. "Crescit in humidis montanis prope Cinapecuaro, alt. 970 hexap. (Regno Mexi-

cano.)" A duplicate type, received from Humboldt, was examined in the Willdenow Herbarium. Of the specimens in the National Herbarium *Pringle* 8622 is an excellent match for this. The other specimens mostly have longer awns.

Orthopogon holciformis Spreng. Syst. Veg. 1 : 307. 1825. Based on "*Oplismenus holciformis* Kunth."

Panicum holciforme Steud. Nom. Bot. ed. 2. 2 : 257. 1841. Based on *Oplismenus holciformis* H. B. K.

Berchtoldia holciformis Fourn. Mex. Pl. 1 : 41. 1886. Based on "*Oplismenus holciformis* H. B. K."

28. Genus CHAETIUM Nees.

Chaetium Nees, Agrost. Bras. 269. 1829. This genus is based on a single species, *C. festucoides* Nees (op. cit. 270), "Habitat in graminosis et in cultis ad flumen S. Francesci, ad Joazeiro etc. Provinciarum Pernambucanae et Bahiensis." The type specimen, in the Munich Herbarium, bearing the data as published, was collected by Martius.

Fig. 17. *Chaetium festucoides.* (Two views of spikelet and fruit x 5 diam.)

Berchtoldia Presl, Rel. Haenk. 1 : 323. pl. 43. 1830. A single species is included in the genus, *B. bromoides* Presl. (op. cit. 324). "Hab. in Mexico." A part of the type specimen was examined in the Trinius Herbarium.

Both Nees and Presl place their proposed genera next after *Oplismenus*.

Kunth (Enum. Pl. 1 : 146. 1833) places *Chaetium festucoides* in *Oplismenus* but to *Berchtoldia* he gives generic rank. After the generic description he adds "(Charact. gen. ex Presl.)" It is probable that Kunth had not seen either species, but that from the plate in Presl's work he recognized *Berchtoldia* as distinct from *Oplismenus*.

Stendel (Syn. Pl. Glum. 1 : 48. 1854) places *Chaetium* in *Panicum*, section *Echinochloa* under the name *P. chaetium*, and gives (op. cit. 117) *Berchtoldia* generic rank, as did Kunth, and doubtless for the same reason.

Doell (Mart. Fl. Bras. 2^2 : 150. 1877) makes *Chaetium* a section of *Panicum* with the single species *P. chaetium* Steud. In the observations (op. cit. 150) he mentions as belonging in this section *Berchtoldia bromoides* Presl, to which he gives the name *Panicum berchtoldium*. Under *P. chaetium* he mentions as an extra-Brazilian specimen *Wright* 735 from eastern Cuba. This number is the type of "*Perotis ? cubana*" Wright, *Chaetium cubanum* (Wright) Hitchc.

Bentham (Linn. Soc. Journ. Bot. 19 : 46. 1881; Benth. & Hook. Gen.

Pl. 3 : 1077, 1104. 1883) recognizes *Chaetium* as a valid genus, as does Hackel (Engler & Prantl, Pflanzenf. 2^2 : 33, 36. 1887) both placing it immediately after *Oplismenus*.

Hemsley (Biol. Cent. Amer. Bot. 3 : 503. 1885) transfers *Berchtoldia bromoides* to *Chaetium* giving Bentham as authority with a reference to the Linnaean Society's Journal mentioned above, but Bentham did not there transfer the species.

Fournier (Mex. Pl. 2 : 40. 1886) gives *Berchtoldia* as a genus, including in it Presl's species, and also two species of *Echinochloa*.

Description.—Inflorescence a dense, narrow panicle; spikelets short-pediceled, dorsally compressed, lanceolate and having a long, slender callus-like base from the elongation of the joint of the rachilla between the glumes, the bearded base of the first glume adnate to it; glumes bearing awns 3 to 4 times the length of the body of the spikelet, the first reduced to the awn or, in *C. bromoides*, the pair broadened and enclosing the rest of the spikelet; sterile lemma bearing a shorter awn or awn-tipped only, the sterile palea obsolete; fruit subindurated, lanceolate, the lemma acuminate into a scabrous awn or point, the thin margins flat, the summit of the palea not enclosed. Perennials with long, narrow leaves; the genus containing but three known species, one of Mexico and Central America, one of Cuba, and one of Brazil.

29. Genus TRICHOLAENA Schrad.

Tricholaena Schrad. in Schult. Mant. 2 : 163. 1824. Three species are included in the genus but the second and third are preceded by a question mark, hence the first, *T. micrantha* Schrad., of which *Saccharum teneriffæ* is given as a synonym, is the type.

Rhynchelytrum Nees in Lindley, Nat. Syst. ed. 2. 446. 1836. The genus is described and a single species, *R. dregeanum*, given. We have not seen the type specimen but the generic description applies to *Tricholaena*. Stapf (Dyer. Fl. Cap. 7 : 444. 1898) refers *R. dregeanum* to *T. rosea* Nees.

Monachyron Parl. in Hook. Niger Fl. 190. 1849. A single species, *M. villosum*, is included. The type specimen has not been examined. Hackel (Engler & Prantl, Pflanzenf. 2^2 : 36. 1887) gives this as a synonym of *Tricholaena*, and Durand and Schinz (Consp. Fl. Afr. 5 : 771. 1895) transfer *M. villosum* to this genus. Making allowance for a misunderstanding of the structure of the spikelet, owing to the remote first glume, the description applies to *Tricholaena*.

The scarcely indurated fruit, scarcely firmer than the usually 2-lobed and awned second glume and sterile lemma, together with the elongation of the rachilla joint between the glumes, serve to distinguish this Old World genus, a single species of which, *T. rosea* Nees, is sparingly escaped from cultivation in the tropics and subtropics of North America.

30. Genus CORIDOCHLOA Nees.

Coridochloa Nees, Edinb. New Phil. Journ. 15 : 381. 1833. This genus is based on a single species, "*Coridochloa* * * * cujus typus est

Panicum cimicinum Retz." Nees states that the genus is allied to *Anthaenantia* Beauv., but is distinguished by the two-flowered spikelets, the fertile floret aristate.

Bentham (Fl. Austr. 7 : 473. 1878) gives "*Coridochloa semialata*, Nees in various catalogues and herbaria" as a synonym of *Panicum semialatum* R. Br., and adds "(the genus not published as generally quoted in Edinb. New Phil. Journ. 1832, July)." It would seem that Bentham must have cited this name and reference from memory. We can not find that Nees himself ever placed *P. semialatum* in *Coridochloa*, nor can we find any reference to the publication of the genus in 1832. It was probably a slip of memory on Bentham's part for 1833. The genus *Coridochloa* is proposed in a footnote with the statement that it will be treated of at another time, hence Bentham may have considered it as insufficiently published. But Nees states that the genus belongs in the tribe *Paniceæ*, names a type species, previously described, and gives the principal distinguishing characters of the spikelet. In Wallich's Catalogue (1849) no. 8749 "Coridochloa fimbriata Nees ab Esenbeck" is listed, "A. Milium cimicinum Hb. Heyn." and "B. Panicum cimicinum Hb. Ham." being given under it. (In a note on page 132 of the Catalogue it is stated that "Mr. Brown * * * has had the goodness * * * to furnish the provisional list of the family" of grasses). In a criticism of Nees, Bentham (Linn. Soc. Journ. Bot. 19 : 18. 1881) again says "Brown's Australian *Panicum semialatum*, for instance, is raised by Nees to the rank of a genus under the name of *Coridochloa* in India, and that of *Bluffia* in South Africa." It may be that Bentham did not know *Panicum cimicinum* Retz., for (op. cit. 42) he says "*P. semialatum* Br. is widely spread over the Old World, for I am unable to distinguish the Asiatic *Coridochloa*, Nees, and the South African *Bluffia*, Nees, from Brown's Australian species."

Hooker (Fl. Brit. Ind. 7 : 64. 1896) places *Panicum cimicinum* and *P. semialatum* under *Axonopus* Beauv. (See discussion under that genus.) Under the second species is given as a synonym "*Coridochloa semi-alata*, *Nees*, in Edinb. New Phil. Journ. XV. (1833) 381." This is an error, Nees makes no mention whatever of *P. semialatum* nor of any species but *P. cimicinum* Retz.

This unique species has been placed in *Milium* (by Linnaeus) in *Panicum* (by Retzius), in *Axonopus* (by Beauvois), in *Urochloa* (by Kunth), and finally in *Coridochloa*, based on it alone, by Nees.

Coridochloa, which is perhaps rather remotely allied to the next genus, is distinguished by the concavo-convex, scarcely indurated, stipitate fruit, the lemma attenuate into an awn about as long as the body of the fruit, the palea sparsely covered with stalked glandular hairs (in appearance like minute fungi), a few of these sometimes scattered on the margin of the lemma; by the papery glumes and sterile lemma, the second glume conspicuously stiff-ciliate along the lateral internerves, and by the digitate inflorescence, the slender racemes naked at the base or for half their length.

31. Genus ALLOTEROPSIS Presl.

Alloteropsis Presl, Rel. Haenk. 1 : 344. pl. 47. 1830. A single species, *A. distachya*, is included in the genus which is erroneously described. Scribner (Mem. Mo. Bot. Gard. 10 : 37. pl. 33. 1899) and Hitchcock (Contr. Nat. Herb. 12 : 210. 1909) explain the error and emend the genus. Presl's type specimen was examined and photographed in the National Museum at Prague by Professor Hitchcock. It is the same species as *Panicum semialatum* R. Br. (Prodr. Nov. Holl. 192. 1810), *Alloteropsis semialata* Hitchc. (l. c.). There are two plants of the same species on the sheet, one with a ticket marked "Peruanæ montanæ" the other with one marked "Regio montana, Luzon." The Peruvian locality is clearly erroneous.

Bluffia Nees, Del. Sem. Hort. Hamb. 8. 1834. The genus is described and a single species, *B. ecklioniana* Nees, "ab Ecklono * * * in Africa australi detecti," included under it. By Hackel (Durand & Schinz, Consp. Fl. Afr. 5 : 764. 1895), this species is reduced to a variety of *Panicum semialatum ;* by Hooker (Fl. Brit. Ind. 7 : 64. 1896) it is referred to *Axonopus semialatus* as a synonym, and by Stapf (Dyer, Fl. Cap. 7 : 418. 1898) it is reduced to a variety of that species. To us it appears to be specifically distinct.

Holosetum Steud. Syn. Pl. Glum. 2 : 118. 1854. This is based on a single species, *H. philippicum* Steud. "Herbr. Cuming nr. 1363 et 1414. Ins. Philip." Cuming's no. 1363 was examined in the Kew Herbarium. It proves to be *Alloteropsis semialata.*

This genus of two known Old World species does not appear to be closely allied to any other. The two subindurated, awn-pointed florets to some appear to suggest species of *Arundinella*, under which genus Bentham (Fl. Austr. 7 : 545. 1878) describes a specimen of *Alloteropsis semialata*, as *Arundinella Schultzii* Benth., though he gives *Panicum semialatum* on page 472 of the same work. In both species of this genus, as shown by specimens in the National Herbarium, there is not infrequently found a rudiment, 0.3 mm. or more long, beyond the palea of the fertile floret.

The genus is distinguished by the awn-pointed, similarly subindurated staminate and fertile florets, the margins of the fertile lemma thin, flat, the palea not enclosed at the summit, in combination with the subdigitate inflorescence, the short-pediceled spikelets in clusters along the racemes.

The involucrate genera and the others excluded under the first and second divisions of the key will be considered in a subsequent paper now in preparation.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW BAT FROM THE CAROLINE ISLANDS.

BY GERRIT S. MILLER, JR.

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Two bats of the genus *Emballonura* from the Caroline Islands represent a species distinct from any hitherto described.

Emballonura sulcata sp. nov.

Type.—Adult (skin and skull), No. 151,568, U. S. National Museum. Collected on Uola Island, Truk group, Caroline Islands, February 16, 1900, by H. F. Moore (U. S. Bureau of Fisheries).

Description.—Externally like *Emballonura semicaudata* from Samoa except that the size is appreciably greater (forearm 48.5 instead of 45, tibia 19 instead of 17); general color pronts brown, slightly washed with drab below; skull decidedly larger than that of *E. semicaudata* (greatest length 17–17.4 instead of 14.4–15, but not peculiar in general form or in proportion of parts, except that anterior palatine emargination is somewhat deeper and mesopterygoid space wider; dorsal surface of rostrum with conspicuous median longitudinal sulcus nearly 1 mm. wide extending from nares to front of sagittal crest and completely separating the inflated lateral areas. In *E. semicaudata* the inflated areas are broadly in contact along median line, so that longitudinal groove is nearly effaced. Teeth larger than those of the related species but with no appreciable peculiarities of form.

Measurements.—The two specimens give the following measurements, those of the type standing first: tail, 12 (14); tibia, 19.2 (19); foot, 8.2 (8.2); forearm, 48.4 (48.6); thumb, 8.2 (8.6); third finger, 78 (77); fifth finger, 52 (53); greatest length of skull, 17.0 (17.4); condylobasal length, 15.2 (—); zygomatic breadth, 10.0 (10.0); lachrymal breadth, 7.0 (7.0); postorbital constriction, 3.4 (3.6); breadth of braincase, 8.0 (8.0); mandible, 12.2 (12.2); maxillary toothrow (exclusive of incisors, 6.6 (6.8).

Remarks.—In size this species lies midway between *Emballonura semicaudata* and the recently described *E. furax* Thomas, of New Guinea. Its cranial characters are, however, strictly of the normal type.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW BLUE GROSBEAK FROM CALIFORNIA.

BY JOSEPH GRINNELL.

Early in 1910 an expedition was sent by the Museum of Vertebrate Zoology of the University of California to the lower Colorado valley, in California and Arizona. While working up the extensive collection of birds obtained, my attention was arrested by the appearance of the blue grosbeaks from that region. Their bills are uniformly very much larger than those of the form previously familiar to me and occurring in summer on the Pacific slope of southern and central California. Examination of specimens and literature shows that the large-billed form is the one already designated and that it is the bird of western California that needs to be named.

Guiraca caerulea salicarius subsp. nov.

CALIFORNIA BLUE GROSBEAK.

Type.—No. 3276, Univ. Calif. Mus. Vert. Zool.; Santa Ana River bottom, near Colton, San Bernardino Co., Calif.; July 21, 1908; C. H. Richardson, Jr., collector.

Diagnostic characters.—Similar to *Guiraca caerulea lazula*, of Arizona and Mexico, in coloration and general size, but bill much smaller and proportionally less tumid, that is, outlines straighter; compared with *Guiraca caerulea caerulea* of the South Atlantic States, blue color of the male paler throughout, bill smaller, and wing and tail longer.

Measurements of type.—Wing, 90.7 mm.; tail, 72.6; tarsus, 20.0; culmen, 15.0; bill-from-nostril, 11.4; depth of bill at base, 11.9; gonys, 9.5; greatest outside width of corneous portion of lower mandible, 10.4.

Habitat.—In summer, the Lower Sonoran zone of central and southern California west of the Sierran divide; in winter, unknown.

Remarks.—This form was characterized, but not named, by Ridgway (Birds N. & Mid. Am., I, 1901, p. 610). It is paralleled in many other passerine genera of the southwest, and since the characters are conspicuous to the trained eye and are fairly constant, the only wonder is that the race has not been provided with a name before.

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PROCEEDINGS

OF THE

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A NEW MOUSE-DEER FROM THE RHIO-LINGA ARCHIPELAGO.

BY GERRIT S. MILLER, JR.

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When describing the napu of Pulo Bakong* I supposed that the animal of Pulo Sebang was identical with it. Further comparison of the material shows, however, that the forms occurring on the two islands must be regarded as distinct.

Tragulus pretiellus parallelus subsp. nov.

Type.—Adult male (skin and skull), No. 123,051, U. S. National Museum. Collected on Pulo Sebang, Rhio-Linga Archipelago, July 30, 1903, by Dr. W. L. Abbott. Original number, 2694.

Diagnosis.—Like *Tragulus pretiellus pretiellus* of Bakong Island, but back less suffused with black and middle region of underparts less tinged with buffy and never with any decided grizzle due to the presence of black-tipped hairs.

Measurements.—Type: head and body, 513; tail, 67; hind foot, 129 (125); condylobasal length of skull, 100.6; zygomatic breadth, 48.6; mandible, 84.8; maxillary cheek-teeth (alveoli), 34.2; mandibular cheek-teeth (alveoli), 39.6.

Specimens examined.—Sixteen, all from Pulo Sebang.

Remarks.—Though readily distinguishable from *Tragulus pretiellus pretiellus* when both forms are considered as a whole, the Sebang animal is not completely differentiated from that of the nearby island of Bakong. Of the sixteen specimens of *parallelus* eleven differ from all *pretiellus* in the absence of a definite buffy area on middle region of underparts. Of the nineteen specimens of *pretiellus* fifteen differ from all *parallelus* in the presence of a noticeable blackish grizzle on buff of upperparts. Fourteen skins of *pretiellus* show a heavy black suffusion on underparts, while in three the suffusion is not conspicuous. Five skins of *parallelus* show a heavy suffusion of black on underparts, while in thirteen it is not conspicuous.

* 1906. *Tragulus pretiellus* Miller, Proc. U. S. Nat. Mus., Vol. XXXI, p. 253, Sept. 11, 1906.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF FOUR NEW TREESHREWS.

BY MARCUS WARD LYON, JR.

[By permission of the Secretary of the Smithsonian Institution.]

During his recent Zoological explorations of the Malayan Archipelago, Dr. W. L. Abbott collected, among numerous other mammals, representatives of four species of treeshrews which have not been previously described. They may be known by the following descriptions.

Tupaia raviana sp. nov.

Type.—Skin and skull, old adult male, Cat. No. 104,355, U. S. N. M., Pulo Rawi, Butang Islands, off west coast Malay Peninsula, Dec. 18, 1899, Dr. W. L. Abbott. Orig. No. 172.

Diagnostic characters.—Related to *T. belangeri* of the neighboring mainland and *T. lacernata* of Pulos Langkawi and Terutau, but skull generally wider, and rostrum especially thicker and wider, interorbital region wider, zygomata more spreading; skin rather intermediate between the two, but more like that of *T. belangeri*.

Color.—Type: Upperparts of head, neck, body, and outer side of legs a grizzle of a color between buff and olive-buff, and blackish, the two colors about equally mixed, and the buffy color inclining toward ochraceous buff in the region of the thighs; underparts generally buffy or an extremely pale gallstone yellow; tail a fine grizzle of cream color and blackish, the latter predominating above and both about equally prominent below except in the middle line where the lighter color is in excess; shoulder stripe not conspicuous, dull cream color.

Skull.—In general like that of *T. belangeri* and *T. lacernata*, but the skull is generally wider, with thicker and wider rostrum and more spreading zygomata. This shows more differences from the related forms than does the skin.

Measurements.—Type, and Cat. No. 123,984, U. S. N. M., *Tupaia lacernata*, an old adult male from Pulo Terutau: Head and body, 184, 180; tail, 165, 145; hind foot (dry), 46, 44; condylobasal length of skull, 46.5, 46; zygomatic width, 25.5, 24.5; width of braincase above

zygomata, 19.19; maxillary toothrow, alveoli, 17.5, 18; width of rostrum back of incisors, 7, 6.5.

Specimens examined.—Two, the type and Cat. No. 104,354, U. S. N. M., from Pulo Adang, Butang Islands.

Tupaia pemangilis sp. nov.

Type.—Skin and skull, adult female, Cat. No. 112,499, U. S. N. M., Pulo Pemangil, east coast Malay Peninsula, June 12, 1901, Dr. W. L. Abbott, Orig. No. 1064.

Diagnostic characters.—A member of the *ferruginea* group closely related to *T. sordida* from Tioman, but slightly duller in color, with slightly grayer feet, and with anterior portion of underparts more buffy, much like that of *T. pulonis* from Pulo Aor.; skull like that of *sordida*, but slightly narrower, and with m^3 rather smaller.

Color.—Type: Upper parts a grizzle of dull tawny ochraceous and blackish, brightest on posterior parts of body, and lightening anteriorly on neck and head to a grizzle of raw sienna (or gallstone yellow) and blackish; outer side of forelegs like top of neck; outerside of hindlegs, like lower back; shoulder stripe moderately conspicuous, between buff and olive buff; throat and chest pale dull buffy; inner sides of legs dull buffy with darker bases of the hairs showing through; tail above a uniform grizzle of cream color and blackish, both colors about equally prominent; below a coarse grizzle of dull buff and black, the buff color predominating along central line; hands and feet a fine grizzle of the colors of the adjacent parts.

Skull and teeth.—Very similar to those of *Tupaia sordida* from the nearby Pulo Tioman, but skull slenderer, and with m^3 rather smaller, and with slightly smaller bullæ.

Measurements.—Type and the type of *Tupaia sordida*, Cat. No. 101,747, U. S. N. M.: Head and body, 185, 171; tail, 150, 165; hindfoot (dry), 40, 41; condylobasal length of skull, 45, 46; zygomatic width, 23, 25.5; width of braincase above roots of zygomata, 19, 20; maxillary toothrow, alveoli, 17.5, 18.5.

Specimens examined.—One, the type.

Remarks.—*Tupaia pemangilis* is only a slightly differentiated form, and were it not for its insular isolation could not be considered more than a subspecies. It is most closely related to *T. sordida* of Pulo Tioman and is not distantly removed from *T. pulonis* of Pulo Aor. The three islands Aor, Tioman, and Pemangil are thus inhabited by Tupaias of the *ferruginea* group differing slightly from each other and as a whole from the mainland form.

Tupaia natunae sp. nov.

Type.—Skin and skull of rather old adult female, Cat. No. 104,714, U. S. N. M., collected on Bunguran, Natuna Islands, June 27, 1900, by Dr. W. L. Abbott, Orig. No. 514.

Diagnostic characters.—Related to *Tupaia splendidula* of Borneo from which it differs in a generally brighter and more reddish coloration of the upperparts, sides, legs and tail, and more inflated braincase.

Color.—Type: General color effect of upperparts of neck and body, in fresh pelage, most like Ridgway's burnt sienna, but rather brighter, this color being produced by a wide band on most of the hairs, of a bright ferruginous burnt sienna mixture, with blackish bases and a considerable number of long blackish hairs; on rump, where an old pelage persists, the general color darker and duller; sides of body and outer side of legs similar to upperparts, but showing a tendency to grizzling; top of nose a grizzle of raw sienna and blackish gradually blending in on top of head with color of upperparts; cheeks and sides of neck an indistinct grizzle of blackish and buff olive; shoulder-stripe buffy to ochraceous buff; an indistinct buffy ochraceous eye ring; underparts generally a color between buff and olive-buff; inner side of legs essentially like sides of body, but rather lighter; tail above generally like back, but in dull worn pelage; underside of tail and bases of tail hairs generally, tawny ochraceous, with the outer and terminal margins of tail dark tawny. A paratype, a barely adult female, is generally like the type in color, but shows distinct grizzling on sides of body, on neck, shoulders and thighs, and indistinct grizzling on upperparts generally.

Skull and teeth.—These are of the same general form as they are in *T. splendidula*, the skull averages longer, however, has a more inflated braincase, and the teeth are distinctly larger.

Measurements.—Type and those of Cat. No. 151,883, *T. splendidula*, from Klumpang Bay, southeastern Borneo; head and body, 184, 189; tail, 140, 130; hindfoot, 40, 41; condylobasal length of skull, 46, 44; zygomatic width, 25, 25; width of braincase above roots of zygomata, 19, 17.5; maxillary toothrow (alveoli), 18.5, 17.

Specimens examined.—Two, the type, and skin and skull, Cat. No. 104,715, a young adult female, also from Bunguran Island.

Tupaia sincepis sp. nov.

Type.—Skin and skull of adult male, Cat. No. 123,105, U. S. N. M., collected on Pulo Singkep, Rhio-Linga Archipelago, August 8, 1903, by Dr. W. L. Abbott, Orig. No. 2732.

Diagnostic characters.—A slightly differentiated form of *Tupaia malaccana* with a more rufescent color on the back, and with a darker and more blackish tail.

Color.—Type: Upperparts of head, neck, and body, and outer side of legs, a fine grizzle of buff and blackish, the buff color being gradually replaced by tawny ochraceous on the lower back, rump, and base of tail; underparts varying from pale buff, or cream color anteriorly to dirty whitish posteriorly; inner side of legs similar to adjacent portions of underparts; tail, above, an indistinct grizzle of ochraceous buff and black, the latter color in excess especially along margin and tip of tail; middle portion of underside of tail cream buff finely lined with blackish, outer

portion and tip generally blackish with a slight admixture of buff or ochraceous buff; upper surfaces of feet ochraceous buff with the dark bases of the hairs showing through; eye ring, fairly well defined buffy; shoulder stripe, well marked, whitish. The rest of the series are essentially like the type, but three of them are more tawny about the rump and base of tail.

Skull and teeth.—These show no special characters by which *Tupaia sincepis* can be distinguished from *T. malaccana*.

Specimens examined.—Six, the type and five others, all from the island of Singkep.

Measurements.—Head and body, 140; tail, 165; hind foot, 37; condylobasal length of skull, 36.5; zygomatic width, 20.5; width of braincase above roots of zygomata, 16.5, maxillary toothrow (alveoli), 13.

Remarks.—*Tupaia sincepsis* is very closely related to *T. malaccana* from the Malay Peninsula. Specimens from the islands of Linga and Sumatra appear to be rather intermediate between the two forms, those from Sumatra being more like the Peninsular animal. The Linga specimens resemble *T. sincepsis* in having a tawny color on the back, but lack the darker tail.

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PROCEEDINGS

OF THE

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RECENT ADDITIONS TO THE FISH FAUNA OF THE DISTRICT OF COLUMBIA.

BY BARTON A. BEAN AND ALFRED C. WEED.

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Since the publication of the list of fishes of the waters of the District of Columbia and vicinity by Smith and Bean* several species not there listed have been taken. Some of these have been introduced by agents of the Bureau of Fisheries, others which were present were overlooked in the making of the collections previously listed.

In view of the changes in fish fauna which are being made by the introduction of new species in various waters it seems advisable to publish, as soon as possible, notes on the appearance of species in waters foreign to their natural habitat.

According to U. S. National Museum records the large mouth black bass was present in the Potomac long before the date given by Smith and Bean (1889). No. 16,841 of the Museum register reads: "Black bass, *M. salmoides*, upper Potomac, weight 4 lbs. 11 ozs., Major Hobbs, Washington, D. C." This fish was cast in plaster by Mr. Jos. Palmer, cast No. 602, date November 1, 1876. We have recently seen the mold of this specimen and there is no doubt as to its identity.

Ictalurus furcatus (La Sueur).

Dr. Hugh M. Smith kindly furnishes the following note on the occurrence of this species in the District of Columbia:

"In 1905 the fishermen about Washington began to catch this species, and samples were submitted to the Bureau of Fisheries for identification. There is no record of the introduction of the species and it is evident that it was not distinguished from *I. punctatus* at the time the young were planted. Specimens weighing over thirty pounds have been reported."

* Bull. U. S. Fish. Com., vol. 18 (1898), pp. 179–187.

Schilbeodes gyrinus (Mitchill).

A specimen of this little Mad Tom was taken in Little Beaver Dam Branch, Anacostia River, May 25, 1911, by Mr. Weed.

Pimephales notatus (Rafinesque).

BLUNT-HEAD MINNOW.

Exceedingly common in the pools of all the swifter streams about Washington. Mention of this species was omitted by error from the previous list.

Notropis arge (Cope).

Many specimens provisionally identified as this species have been taken in the lower portion of Cabin John Run. These specimens may prove to be *Notropis photogenis* if the two species are finally proven to be specifically separable. These fishes may have been introduced from the Ohio River drainage.

A very large number of fishes of many species were taken in Cabin John Run December 4, 1909, and March 19, 1910. These hauls were made with a twenty-foot bag seine (Baird collecting seine) under the Chesapeake & Ohio Canal. The haul that was made in December took many thousand fish, about half of which were *Pimephales notatus* and the rest various small minnows. All the fish were unusually silvery in color.

Notropis amœnus (Abbott).

This species has been taken in moderate numbers in Cabin John Run and in some of the other streams flowing into the Potomac River. It is listed by Evermann and Hildebrand from the Mattapony River, Virginia.*

Ericymba buccata Cope.

This common western minnow occurs in fairly large numbers in the lower portion of Cabin John Run. It was probably introduced in the upper portion of the Potomac River by the U. S. Bureau of Fisheries.

Lepomis cyanellus Rafinesque.

This western sunfish occurs in very large numbers in pools in the river in the neighborhood of Chain Bridge. Few large specimens are seen but very many ranging from one to three inches in length. Ten specimens, each about three inches in length, were caught in considerably less than ten minutes, in a small pool. All were taken on hook and line, using a single small piece of angleworm as bait. This species was probably introduced into the upper portion of the Potomac River.†

* Proc. Biol. Soc. Wash., vol. XXIII, p. 158.

† First published record of *L. cyanellus*, Bean and Weed, Proc. U. S. Nat. Mus., 40, p. 376, plate 50.

Lepomis auritus (Linnæus).

It is probable that there are two species confused under this name in the waters of the District of Columbia and vicinity. Living specimens of both may be seen in the aquarium of the Bureau of Fisheries at Washington, D. C. Both are distinguished by the great length of the opercular flap but otherwise are very dissimilar in color. One is a rather slender fish having the body-color and color changes of *Lepomis cyanellus*. It is very difficult to distinguish this form from *Lepomis cyanellus* except by the character of the opercular flap which is long and pointed, extends obliquely upward and has a straight light colored line along its upper and its lower edge. These lines extend well on to the operculum. The other form is much deeper bodied and has the body-color of *Lepomis gibbosus*.* The opercular flap extends horizontally, is about as wide at its distal end as at its proximal end and appears rather truncate. Two forms have previously been described under the names *Lepomis auritus* and *Lepomis auritus solis*. It appears rather probable that the slender form should stand as a separate species under the name *Lepomis solis*.

Lepomis pallidus (Mitchill).

This species is taken in the Potomac River, in the Tidal Basin and in the lower portion of the Eastern Branch. This species may be native rather than introduced, as it is an inhabitant of the deeper waters where ordinary scientific collecting might easily overlook it.

Doctor Smith furnishes the following note on the occurrence of this species in the Potomac River as early as 1900:

"Extract from letter from R. Hessel, May 2, 1900.

"In regard to the *Lepomis pallidus* I sent the other day to Central station, I have the following to state: Four years ago, in June, 1896, I went with some of the men of the station to the Potomac to get some living food for the black bass. Hauling the large seine I caught about 1,600 young fish—sunfish, catfish, roaches—and amongst the sunfish—about 500 of ¾ of an inch in length—I noticed three small sunfish of the same size, but of a little different shape from the common sunfish; they seemed to be of more slender form and had a little darker coloration. I examined all the fish I had in the tub and found 14 in all. I tried to get some more of them and made a few more hauls, but could not find any more.

"I put the 14 young fish in a small pond to see their development. Four of them died and the others developed very well. I feed them on mashed fish, and last year they spawned and I have now about 2,000 on hand."

These specimens were identified by Dr. W. C. Kendall.

Stizostedion vitreum (Mitchill).

The Bureau of Fisheries has planted a large number of pike perch fry in the Potomac (during the years 1901 to 1904) and a number of specimens have been taken.

* See: Bean and Weed, Proc. Biol Soc. Wash., Vol. XXIV, p. 73.

Boleosoma longimanus (Jordan).

Many specimens of this species, which was previously known only from the headwaters of the James River in Virginia, have been taken in the Northwest Branch about one mile above Hyattsville, Maryland. It occurs in company with *Boleosoma olmstedi* but seems to prefer rather deeper water. All the specimens were taken in a stretch where the water, about two feet deep, flows rapidly and without ripples over a bottom of medium sized gravel (stones one to four inches in diameter).

Etheostoma flabellare Rafinesque.

Two specimens have been taken in Cabin John Run. Cat. No. 64,398, U. S. Nat. Mus., was taken December 2, 1909, and No. 66,330 March 19, 1910.

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PROCEEDINGS

OF THE

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THE LOUISIANA PUMA.

BY N. HOLLISTER.

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An attempt to identify the specimens of pumas in the collection of the United States National Museum has resulted in the discovery that the form found in Louisiana is very different from any yet described. This new form is represented in the museum collections by three specimens; two skulls from Mer Rouge, Morehouse Parish, collected by J. Fairie many years ago, and a skin and skull in the Biological Survey collection from Vidalia, Concordia Parish. The Louisiana puma is much more closely related to the puma of Florida than to the northern form or to *Felis oregonensis azteca*. It is readily separable from both the first and the last species by very marked color differences. The museum is fortunate in possessing two skulls each of *Felis couguar* from New York and *Felis coryi* from Florida, as well as good series of the western species. The pelage of the Florida puma has been carefully described by Mr. Chas. B. Cory,* by Mr. Outram Bangs,† and by Dr. C. Hart Merriam,‡ and Mr. Bangs has proved that it varies little in color with the season. From the records of the occurrence of the puma in the Southern States collected and published by Dr. F. W. True § it seems certain that the distribution between Florida and Louisiana was at one time continuous. As so little is known of the animal formerly inhabiting that region, however, and as the Louisiana puma differs so greatly from the Florida animal in color it seems best to regard it at present as a distinct species.

* Hunting and Fishing in Florida, p. 109, 1896.

† Proc. Biol. Soc. Washington, XIII, pp. 15–17, 1899.

‡ Proc. Washington Acad. Sci., III, pp. 583–585, 1901.

§ Report U. S. Nat. Mus., 1888–'89, pp. 591–608, 1891.

Felis arundivaga sp. nov.

Type from 12 miles southwest of Vidalia, Concordia Parish, Louisiana. No. 137,122, U. S. National Museum (Biological Survey Collection), skin and skull of ♂, adult (occipito-sphenoid suture entirely closed); collected June 17, 1905, by B. V. Lilly.

General characters.—A large puma of the *Felis coryi* type but lacking the bright ferruginous color; skull much larger than in *Felis couguar*, with the very broad nasals and highly developed saggital crest of *F. coryi*. Differs externally from *Felis o. azteca* in its darker coloration and very pronounced caudal stripe.

Color of type.—Upperparts, including outer sides of limbs, grayish fawn color with a decided cast of ecru drab, especially on flanks and legs; nape, withers, and an indefinite stripe down back to rump brighter, pale rufous; the entire upperparts finely mixed with dusky, the darker color of the hair tips. Face from crown to nose darker, blackish, with clear black spot each side of nose; a white streak over eye; ears blackish outside, with edge of gray and lining of white hairs. Lips and throat almost pure white, shading through creamy white to fulvous on breast. Insides of legs grayish, mixed brown and white hairs; fur of foot pads dark brown; feet like legs and flanks. Tail much darker than back with a sharply defined stripe of dark brown along the entire length of upper surface from rump to the short black tip.

Skull and teeth.—Skull large, massive, with the large, broad nasals and high saggital crest as in *F. coryi;* but with larger audital bullæ. Much larger than the skulls of *F. couguar*, with well developed crest and much larger nasals; bullæ much larger; opening of anterior nares very much larger; teeth, especially the second and third upper premolars, larger.

Measurements.—Skin of type: Total length, 2100 mm.; tail, 735 (measurements from tanned skin). Skulls of type and an adult male, very slightly younger, from Mer Rouge, Louisiana; the latter in parentheses: Condylobasal length, 193.5 (192); basal length, 180 (178); zygomatic breadth, 149 (—); palatal length, 87 (88); postpalatal length, 95.5 (97); least interorbital breadth, 43.5 (46); greatest length of nasals, 63 (60); greatest breadth of nasals, 36.3 (35.4); length of upper premolar row, 46.1 (46); length of audital bulla, 36 (37); length of lower molar-premolar series, 45.7 (46).

Remarks.—The rich ferruginous or intense rusty red back and other color characters of *Felis coryi*, and the pale uniformly colored back and tail of *Felis oregonensis azteca*, are enough to distinguish readily the Florida and Texas forms from the Louisiana puma.

Pumas are still fairly common in the wilder parts of the cane brake region of eastern Louisiana. In the early spring of 1904 while Mr. Waldo E. Forbes of Boston, Mr. B. V. Lilly of Louisiana, and I were hunting in the Bear Lake Cane we heard pumas calling in the forests at night, and several times succeeded in starting the animals with the hounds, but they were invariably too fast for our slow bear dogs and always quickly left

them in the distance. The following notes are taken from my field notebook of this trip:

February 23 (1904). Heard panthers crying about nine o'clock last night. There were probably two of them as the calls were sounded at short intervals, some times only about a minute apart, and one seemed a little farther away. The animals were evidently moving along to the north. The cry is a long drawn out, shrill trill, weird and startling. It commences low on the scale, gradually ascends, increasing in volume, and then lowers at the end. Forbes and Lilly put the hounds after them early this morning, but without success. Heard panther again in evening. February 24. Made a drive for the panther again this morning but did not run him hard enough to tree. February 26. Heard panthers to-night on both sides of Bear Lake. February 27. Crossed the lake early this morning and made a drive for the panther but the dogs seemed to lose trail at lake. Lilly says that panthers take readily to water and he thinks this one crossed to our side before morning. Made a drive on our side and soon started a panther in the cane. The animal promptly outdistanced the dogs after badly slitting an ear for one of them. February 28. Heard the panther's trilling wail across the lake to-night. We went out in the boat and silently paddled quite near him in an effort to "shine" his eyes, but failed to get a shot.

I believe the pumas call more in the early spring than at any other season, and we were probably very fortunate in the time of our visit to the cane, as the experience was one of very great interest. Mr. Lilly's efforts to obtain a good specimen for the Biological Survey resulted in the capture of the type the following year.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SOME OBSERVATIONS ON A PHOTOGENIC MICRO-ORGANISM, *PSEUDOMONAS LUCIFERA* MOLISCH.

BY F. ALEX. McDERMOTT,

[Hygienic Laboratory, U. S. Public Health and Marine-Hospital Service, Washington, D. C.]

Some years ago Dr. R. E. B. McKenney published in the Proceedings of the Biological Society a very interesting paper on luminous bacteria (Proc. Biol. Soc. Wash., 1902, Vol. 15, pp. 213–234). The form which serves as the basis for what is to follow has been isolated since Dr. McKenney's paper was published, and appears to present some points of possible interest. This organism is *Pseudomonas lucifera* Molisch, isolated by Prof. Hans Molisch, of the Plant Physiology Institute of the University of Vienna, and it is through the courtesy of Professor Molisch that the parent culture for this work was obtained. The organism was isolated from sea-water, and is claimed by the discoverer to give the brightest light of any bacterial form so far isolated.

Like most other luminous micro-organisms, *Ps. lucifera* will grow on the ordinary culture media, under aerobic conditions, but for luminescence there must be present 2.5 to 3.0 per cent of sodium chloride, or some one of certain other mineral salts. The use of media made from fish-meat is unnecessary. The light given by ordinary bouillon-gelatin-salt cultures is a soft and beautiful green, which after the eyes become accustomed to it, appears of considerable intensity. A veritable "living lamp," as Dubois has called it, may be made by coating the inside of a sterile flask with the bouillon-gelatin-salt medium, and then inoculating the surface of the gelatin with a liquid culture. Such a lamp will continue to give light for about a week, though the light

gradually weakens, owing to the drying of the medium, and finally dies out; the maximum intensity of light is about 48 hours after inoculation.

Agar cultures appear to grow about as well as gelatin cultures but luminesce weakly or not at all, even in the presence of the proper amount of mineral salts. Liquid media of very simple composition serve for the growth of the organism; the simplest medium serving for luminosity is a 3.0 per cent solution of salt, containing 1.0 per cent of asparagin.* This medium is of course not the best; cultures in it are short-lived, and glow only feebly; a better medium is—

Sodium chloride	2.5%
Magnesium chloride	.5
Peptone	1.0
Asparagin	1.0
Glycerin	.5

Larger amounts of peptone and asparagin act adversely to growth; the organism is apparently sensitive to "over-feeding." It will grow and luminesce in milk containing 3.0 per cent of common salt; the light on the surface is quite bright. As a rule, however, the light from luminous cultures is much less intense than that from gelatin, though when shaken gently, the light perceptibly increases in intensity. The mineral salt present may be any one of several, but the brightest cultures have been obtained by the use of 2.5 per cent of sodium nitrate, and 0.5 per cent of magnesium chloride. All media must be faintly alkaline to litmus.

The spectrum of the light emitted by a gelatin culture is of very limited range, extending from the yellow-orange to the indigo, with a decided maximum intensity in the green. This spectrum is of less extent than that of our local fireflies (*Photinus pyralis*, *Photuris pennsylvanica*, etc.) although the appearance of the light to the eye does not differ so very much from that of the last-mentioned Lampyrid. In liquid cultures the light appears to the eye to be more whitish, though the range of the spectrum is the same; probably the maximum intensity is shifted to a different point.

* In this connection it is of interest to note that Wood (Journ. Amer. Med. Assn., 1911, Vol. 56, pp. 1094-6), has recently recommended "normal" (physiologic) salt solution as an emergency culture medium for many bacteria.

Forsyth (Nature, 1910, Vol. 43, p. 7) has reported the discovery, by spectrophotography, of ultra-violet rays in the light of *Photobacterium phosphorescens* Fischer. This seems very remarkable, especially in view of the fact that ultra-violet light is used as a bactericide, and the further fact that previous photographs of the spectrum of the light of these organisms had failed to show the presence of such rays. In this connection solutions and crystals of para-amino-ortho-sulpho-benzoic acid* have been exposed to the light from large cultures of *Ps. lucifera*, and have failed to show the least trace of fluorescence, although this substance is used to detect ultra-violet radiation by means of its fluorescence. It seems very unlikely that this organism emits ultra-violet radiation.

Luminous cultures of *Ps. lucifera* on the usual culture media do not appreciably affect a charged electroscope. For the conduct of the experiments leading to this conclusion, I am indebted to Drs. F. W. Clarke and R. C. Wells, of the Geological Survey.

In its chemical conduct this micro-organism exhibits only certain slight similarities to the firefly. Professor Kastle and the author have shown that the luminous tissue of the Lampyridae which has been dried in the absence of oxygen—preferably in a hydrogen vacuum—and sealed in hydrogen, will exhibit luminosity when moistened, for at least thirteen months after preparation (Amer. Journal Physiol., 1910, Vol. 27, pp. 122–151, November), and since the above paper was written, specimens prepared at the same time have glowed on moistening after eighteen months; in fact there seems to be no good reason why they should deteriorate at all. The author has found that if commercial hydrogen peroxide solution is used in place of water for moistening the dry material, a much brighter light is obtained, whose spectrum is of about the same range as that of *Ps. lucifera*, though with its point of maximum intensity nearer the yellow. (Canadian Entomologist, November, 1910, Vol. 42, pp. 357–363.) Somewhat similar observations may be made upon this micro-organism. An open vessel filled with sulfuric acid was placed upon the bottom of a flask, the walls of which were coated with a luminous gelatin culture of *Ps. lucifera*, the flask filled with hydrogen, tightly stoppered, and set away. After two

* Kindly sent me by Prof. J. H. Kastle of the University of Virginia (See American Chemical Journal, January, 1911).

days the gelatin showed signs of being drier, and the culture did not glow. A small portion of the gelatin was removed by means of a spatula and placed in a Petri dish; it glowed feebly in the air, the glow being just perceptible in a dark room. A few cubic centimeters of 2.5 per cent hydrogen peroxide solution were then run upon the gelatin, when a number of bright points showed for an instant, after which no glow was visible. Attempts to completely dry liquid cultures, and to harden gelatin cultures in a hydrogen vacuum have so far been unsuccessful on account of the leakage of the apparatus. Nitrobenzol, which Dr. Kastle and the author found to be a powerful stimulus to activity on the part of the luminous tissue of the firefly, was without effect in stimulating the luminous activity of gelatin cultures of this organism whose luminosity was on the wane, and when added to liquid cultures promptly extinguished them. A solution of sodium nitrite added to a liquid culture of *Ps. lucifera* extinguished the light instantly. Both of these substances are germicides, and the results obtained are those which would naturally be foretold. The addition of a few drops of 1 : 10,000 adrenalin hydrochloride solution to 20 c. c. of a liquid luminous culture of this organism produced no immediate effect, but after 18 hours, the culture was apparently dead; adrenalin was found to be a powerful stimulant of photogenic activity in the firefly, when injected into the living insect. It would appear, therefore, that in the firefly, these exciters act upon the nervous system, and not directly upon the luminous tissue.

Oxygen under a maximum pressure of two or three atmospheres was applied to a liquid culture in a closed bulb; the light emitted became much stronger as long as the oxygen pressure was maintained; sudden release of the oxygen pressure was followed by a slow diminution of the intensity of the light. A liquid culture placed in a desiccator filled with hydrogen gave no light after about five minutes; it also failed to give light when treated with hydrogen peroxide at the end of three days, when it had dried out to the point of crystalization.

But little can be said as to the chemical processes by which these organisms produce light. The process is certainly one of oxidation, or at least one requiring the presence of oxygen, as is the case with the firefly. Probably the actual use made of

the oxygen is somewhat similar to use made of it in the luminous insects, except that the gas is taken by the cells directly from the air to which the organism is exposed, whereas in the firefly an intricate network of tracheæ supply the air for the process. But while the nature of the light emitted by these organisms, and some of their chemical properties suggests a general similarity of the photogenic processes in the two forms, it is by no means necessary to assume that it is identical. It may even prove that in organic chemistry we may have photophore groupings, as we now have fluorophore groups and chromophore groups, and that biologic oxidations producing very similar luminous manifestations may actually involve very different active substances. The fact that these organisms will luminesce in a medium consisting of water containing three per cent of salt and one per cent of asparagin—α-amino-succin amidic acid—

$$HOOC.CH_2.CHNH_2.CONH_2,$$

suggests that the process may really be less complicated than would at first seem.

So far as I know, *Ps. lucifera* is not pathogenic for man. It appears to be very small, and in common with most photogenic micro-organisms, it is rather delicate; it grows and luminesces best at 18–22° C.; 28 to 30° C. will kill the cultures.

The whole subject of the photogenic bacteria has been pretty thoroughly covered in Professor Molisch's book, Leuchtende Pflanzen (Jena, 1904), and a very exhaustive and interesting review of the entire subject of biophotogenesis,—regretably in German again,—has been published by Prof. Ernst Mangold of Greifswald, under the title Die Produktion von Licht, as the 2nd half of the third volume of Hans Winterstein's Handbuch der vergleichende Physiologie. (Jena, 1910.)

I have to thank Mr. Wm. Lindgren, of the Hygienic Laboratory, for propagation of this organism from the culture sent me, and for advice in handling the same.

Vol. XXIV, pp. 185–186 June 23, 1911

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTION OF A NEW PHILIPPINE FLYING-SQUIRREL.

BY N. HOLLISTER.

Among some mammals submitted for identification to the United States National Museum by the authorities of the Philippine Bureau of Science, is a flying-squirrel from Basilan Island, which proves to be new.

Sciuropterus crinitus sp. nov.

Type from Basilan Island, Philippines. No. 101, Collection of Philippine Bureau of Science. ♂ adult; skin and skull. Collected by Richard C. McGregor and A. Celestino, January 12, 1907.

General characters.—A large member of the subgenus *Petinomys;* externally somewhat like *Sciuropterus* (*Hylopetes*) *nigripes* of Palawan, but size smaller; ears very small, with three long tufts of hair, one from below, and one from each side; feet grayish-brown instead of black, and tail brown. Fur of back and upper side of parachute long and heavy; belly thinly haired.

Color of type.—General color of upperparts pale chestnut, finely mixed with black. Nose and lips gray; crown, back, and upper surface of parachute and tail pale chestnut, finely lined with black; tail blackish near tip; underfur slate color, the hairs tipped with the chestnut and black. Ear tufts brown at base, black at terminal half; whiskers long and black. Limbs and margin of parachute blackish and buffy; feet grayish-brown. Underparts of body and limbs buffy, the underfur gray; under side of tail pale chestnut, lighter along median line.

Skull and teeth.—Skull resembling those of the other larger members of the subgenus *Petinomys;** but bullæ slightly less flattened and cheek teeth with the small accessory cusps at outer exit of the valley between the two main transverse ridges very minute. Compared with a skull of *Sciuropterus* (*Petinomys*) *hageni* from Sumatra, which is of the same essential size, it has a narrower zygomatic breadth, with a slightly wider

* See Thomas, Annals and Mag. Nat. Hist., 1908, I, p. 6.

rostrum; interorbital breadth less; all teeth slightly larger; zygomata lighter; and bullæ slightly less flattened (but still very broad and low and not inflated to anywhere near that degree found in species of the other subgenera). Mastoids not inflated. Small premolar robust, and other cheek teeth slightly increasing in size backward; crowns low; enamel finely sculptured; ridges low, with transverse ridges somewhat broken, the supplementary cusps between them small, but plainly visible on pm^4, and less on m^1; obsolete on m^2.

Measurements of type.—Total length, 570 mm.; tail, 260; hind foot, 42. Ear from notch (relaxed on dry skin), 13.5; length of ear tufts, 36. Skull.—Greatest length, 53; condylobasal length, 48.6; basal length, 45.1; zygomatic breadth, 32; least interorbital breadth, 10.1; greatest breadth of nasals, 9.2; mastoid breadth, 22; length of maxillary tooth row (alveoli), 11.6; length of mandible from anterior surface of symphysis to condyle, 32.5.

Remarks.—It is interesting that this second known Philippine flying-squirrel belongs to a different subgenus from the Palawan species, *S. nigripes*. Though the subgeneric characters in *S. crinitus* are less pronounced than in some other species, there seems no question as to its place in *Petinomys*.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF NEW AMERICAN BIRDS.

BY OUTRAM BANGS.

The American birds described as new in the following pages are from various sources, and are such as have turned up from time to time during the process of arranging and identifying the collections in the Museum of Comparative Zoology.

Rupornis magnirostris occidua subsp. nov.

Type from Rio Tambopata, eastern Peru, adult (♂?), no. 47,362, Coll. Mus. Comp. Zool. Collected by Dr. W. C. Farrabee, in May, 1907.

Characters.—Similar to true *R. magnirostris* (Gmelin) of Colombia, Guiana, and Amazonia, with the upper parts pale gray and the belly and flanks barred with white and pale cinnamon-rufous, but with the chest bright cinnamon-rufous as in *R. magnirostris natteri* (Gel. & Salv.) of Brazil, not gray as in true *R. magnirostris*.

Measurements.—Type, adult (♂?): wing, 213; tail, 143; tarsus, 63; culmen, 29.

Remarks.—The type of this new hawk was brought home, with other birds, by Dr. Farrabee, from his three years' trip to Peru and Bolivia. I tried in vain to reconcile it to either of the recognized subspecies, and upon hunting up the literature found that Hellmayr (Novit. Zool. Vol. XVII, p. 411, Dec. 1910) had already discussed similar specimens, from the same general region, arriving at the conclusion that, in all probability, they represented a third subspecies, intermediate in character between the other two.

Penelope perspicax sp. nov.

Type from San Luis, Bitaco Valley, western Colombia, adult ♀, Mus. Comp. Zool., no. 23,606, Bangs Coll. Collected June 5, 1908, by Mervyn G. Palmer.

Characters.—Somewhat like *P. cristata* (Linn.) of Central America but *much* smaller and with the feathers of crest, hind neck and mantle bordered by grayish white; wings, except primaries and bastard wing, metallic; bronzy brownish-like tail; primaries metallic, dark, greenish

olive (in *P. cristata* the whole wing is of this latter color). About the size of *P. boliviana* Bp. of Peru and Bolivia and with similar grayish white edging to feathers of upper parts, but with under parts as in *P. cristata* with the chestnut restricted to lower belly and under tail coverts.

Measurements.—Type, adult ♀: wing, 289; tail, 292; tarsus, 82.5; culmen, 34.5.

Remarks.—In the collections made in western Colombia by M. G. Palmer, which I got of Rosenberg, there were but two skins of this apparently very distinct species, one the type, the other a young bird just able to fly taken at Pavas, March 29, 1908.

Antrostomus rufus otiosus subsp. nov.

Type from the island of St. Lucia, West Indies, adult ♂, no. 28,674, Coll. Mus. Comp. Zool. Collected by John Semper in 1878 or 1879.

Characters.—Similar to true *A. rufus* (Bodd.) of continental South America (north to Panama), but much larger, with a heavier bill.

Measurements.—

Antrostomus rufus rufus (Bodd.).

No.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Exposed Culmen.
190,352*	♀ ad.	Venez. Escorial . . .	174	116	15	9.5
6,941†	♀ ad.	Colombia, Santa Marta Mts.	176	118	16	10
14,053†	♀ ad.	Panama, near Panama . .	175	114	16.5	11

Antrostomus rufus otiosus Nob.

No.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Exposed Culmen.
80,893*	♂ ad.	West Indies, St. Lucia . .	184	130	17	14
80,894*	♀ ad.	" " "	187	122	17	13.5
27,373‡	♀ ad.	" " "	185	124	16.5	14.5
32,390‡	♂ ad.	" " "	187	126	18	13
27,372‡	♂ ad.	" " "	186	130	17.5	13.5
28,674‡	♂ ad.	" " "	187	127	17	14

Remarks.—Upon comparing a fairly good series of *A. rufus* from the mainland and from St. Lucia, the island birds were found to be so much and so constantly larger, that they can be regarded as representing a distinct subspecies.

I notice that Hartert accords to *Antrostomus rufus* an individual variation in size about corresponding to the differences between the island and the continental forms, and I suspect his larger birds were from St. Lucia and his smaller ones from the mainland.

* Coll. U. S. National Museum.

† Coll. E. A. and O. Bangs.

‡ Coll. Mus. Comp. Zool.

Thamnophilus doliatus catus subsp. nov.

Cotypes from El Valle, Margarita Island, Venezuela, adults, ♂ and ♀, Mus. Comp. Zool. nos. 2712 (♂) and 2715 (♀), Bangs Coll. Collected by Austin H. Clark July 14 (♂) and July 7 (♀), 1901.

Characters.—Similar to *T. doliatus fraterculus* Berlepsch and Hartert of Venezuela and Trinidad, but somewhat smaller with somewhat smaller bill; adult ♂ with the black bands below still narrower—the under parts being white very narrowly and rather irregularly barred with black; white bands on tail as in *T. doliatus doliatus* (Linn.) of Surinam. Adult ♀ exceedingly pale, the upper parts, except pilium, ochraceous, as pale as in the Yucatan form *T. doliatus yucatanensis* Ridg., from which the female of the new form differs little except in smaller size.

Measurements.—

No.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Culmen.
2711	♂ad.	El Valle, Margarita Isl.	66	54	24	18.5
2712	♂ad.	" "	64	55	24.5	18
2713	♂ad.	" "	67	54	24.5	17
2714	♂ad.	" "	65	51	25.5	18
2715	♀ad.	" "	68	55	26	18
2716	♀ad.	" "	67	54	26	17

Remarks.—As *Thamnophilus doliatus* has now, by general consent, been divided into a number of subspecies, I feel little hesitation in adding another quite as good, it seems to me, as those already recognized. Individual variation in this species must, however, always be reckoned with, and series, not individuals, compared.

The pale colors of the female of the Margarita Island form have already been mentioned by Cory in his list of Birds of the Leeward Islands, based upon Ferry's series of fourteen skins, of which eight were females.

Pyrocephalus rubineus blatteus subsp. nov.

Type from Sabune Dist., British Honduras, adult ♂, Mus. Comp. Zool., no. 19,812, Bangs Coll. Collected May 2, 1906, by Morton E. Peck.

Characters.—Similar to *P. rubineus mexicanus* Sel. of Mexico and the southwest border of the United States, but smaller, with an actually as well as relatively broader bill; adult male with red of under parts and pileum more crimson, less orange—about geranium red.

Measurements.—

No.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Culmen.
19,812	♂ad.	Br. Hon. Sabune Dist.	73	53.5	15.5	13
40,145	♂ad.	Yucatan	73.5	55.	16	12.5
40,146	♂ad.	"	74	54	16	12.5

Remarks.—This new form of the vermilion tyrant-bird occupies Yucatan, British Honduras and parts of Guatemala. The specimens which I have examined are conspicuously different from the more northern race. Its characters were fully pointed out by Ridgway in Birds of North and Middle America, but it was not given a name by that distinguished ornithologist.

Leistes superciliaris petilus subsp. nov.

Type from Concepcion del Uruguay, adult ♂, no. 31,023, Mus. Comp. Zool. Collected November 27, 1880, by W. B. Barrows.

Characters.—Similar to true *L. superciliaris* Bp. of Brazil in color, but decidedly smaller, with a shorter bill, wing in adult ♂ about 98 (in adult ♂ of *L. superciliaris superciliaris* about 105); culmen in adult ♂ about 19.5 (in adult ♂ of *L. superciliaris superciliaris* about 22.5).

Measurements.—

No.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Culmen.
31,019	♂ad.	Concepcion del Uruguay	96	57	31	19.5
31,020	♂ad.	" " "	96	58	30	19
31,021	♂ad.	" " "	97	60	29.5	19
31,022	♂ad.	" " "	98	56	30	20
31,023	♂ad.	" " "	98	57	30.5	19

Remarks.—I would also suggest the necessity of subdividing *Leistes militaris* (Linn.) and recognizing *Leistes militaris militaris* (Linn.), Guiana and eastern Peru north to Panama, smaller, with a shorter bill, wing in adult ♂ about 93, culmen about 20, and *Leistes militaris erythrothorax* Pelzeln, Lower Amazon Valley, larger, with a longer bill, wing in adult ♂ about 100, culmen about 22.5.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE GENERIC NAME OF THE AFRICAN BUFFALO.

BY N. HOLLISTER.

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Aside from conspicuous and well known differences in the general appearance of the animals and in the types of their horns, the buffaloes of Africa and of the Indian region are differentiated by constant characters of real generic value. At present these buffaloes are commonly combined in the genus *Bubalus*, with *Bubalus caffer* of South Africa as the type, or even loosely thrown in the old Linnæan genus *Bos*. The type of *Bubalus* H. Smith is, however, by tautonymy *Bos bubalis* Linnæus, the Indian Buffalo. The Cape Buffalo and its allies should stand as a separate genus, the correct name for which appears to be *Syncerus* Hodgson. The synonymy and general characters of the two genera follow:

Genus **Bubalus** Smith.

1827. *Bubalus* H. Smith, Griffith's Cuvier's Animal Kingdom, V, p. 371. (Subgenus of *Bos*.) Type by tautonymy, *Bos bubalus* Smith= *Bos bubalis* Linnæus.

Skull much less massive than in *Syncerus;* more narrow and elongated; facial profile nearly straight; rostrum relatively long and slender. Nasal bones elongated and slender, narrowed in middle, and projecting much beyond end of median suture; thus longest laterally. *Vomer fused with palatine bones* and palatine plate of maxilla the *entire length of median suture*. Audital bullæ very small, reaching to about plane of ventral surface of basi-occipital. Molars short and high, crowns almost square. Hair of dorsum reversed, directed forward from haunches to head; ears comparatively small, without conspicuous fringes. Indian Region.

The Tamarau (*B. mindorensis* Heude), from Mindoro, agrees with *B. bubalis* in the above general characters and can not be subgenerically separated. I have not seen a skull of *Anoa depressicornis* from Celebes.

Genus **Syncerus** Hodgson.

1847. *Syncerus* Hodgson, Journ. Asiatic Soc. Bengal, XVI, new series, no. 7, p. 709, July. (Genus.) Type by selection, *Bos brachyceros* Gray.*

1872. *Planiceros* Gray, Cat. Rum. Mamm. in Brit. Mus., p. 10. (Subgenus of *Bubalus*.) Type by tautonymy, *Bubalus centralis* a. *Bos planiceros* Blyth.

1872. *Synceros* Gray, Cat. Rum. Mamm. in Brit. Mus., p. 12. (Subgenus of *Bubalus*.) Type by monotypy, *Bubalus caffer* Gray=*Bos caffer* Sparrman.

Skull massive, short and broad, facial profile concave; rostrum relatively short and broad. Nasal bones short and wide; greatest length mesially. *Vomer not attached to palatine bones.* Audital bullæ large, reaching far beyond plane of ventral surface of basi-occipital. Molars long, crowns relatively narrow. Hair of dorsum directed uniformly backward from neck to rump; ears large, heavily fringed with long hairs. Ethiopian Region.

The following African buffaloes were recognized by the last monographer, Matschie, 1906,† or have been described since the publication of his revision. The specific or subspecific rank of these forms is still very uncertain. I use trinomials where the original describer has done so.

1. *Syncerus azrakensis* (Matschie). Dar Roseres, on the Bahr el Azrak, Egyptian Sudan.
2. *Syncerus brachyceros* (Gray). Central Africa (shores of Lake Tchad, Matschie).
3. *Syncerus caffer caffer* (Sparrman). Sunday River, Eastern Capeland.
4. *Syncerus caffer aequinoctialis* (Blyth). White Nile.
5. *Syncerus caffer cottoni* (Lydekker). Semliki Valley.
6. *Syncerus caffer matthewsi* (Lydekker). Mfumbiro, Ruanda, German East Africa.
7. *Syncerus caffer radcliffei* (Thomas). Burumba, Ankole, S. W. Uganda.
8. *Syncerus centralis* (Gray). ? Atbara, Egyptian Sudan.
9. *Syncerus gariepensis* (Matschie). Ligua River, upper Orange.
10. *Syncerus limpopoensis* (Matschie). Lembobo Mountains, Southern Swasiland.
11. *Syncerus mayi* (Matschie). Bengo, Loanda.
12. *Syncerus nanus* (Boddaert). "Probably somewhere between the Congo and the mouth of the Niger," Lydekker, Wild Oxen, Sheep, and Goats of All Lands, p. 111.
13. *Syncerus neumanni* (Matschie). Chagwe, Uganda.

* Hodgson's genus contains two species, "*Bornouensis* and *Brachycerus*." The first has been overlooked by all recent workers. It dates from 1858, and first appears in Chas. Hamilton Smith's Synopsis of the Mammalia, Jardine's Naturalists' Library, XV, p. 290, as *Bos bornouensis*, with description; type locality, Bornou.

† Sitz.—ber. ges. nat. freunde Berlin, 1906, no. 7, pp. 161–179, July, 1906.

14. *Syncerus planiceros* (Blyth). Gambian Region.
15. *Syncerus ruahaensis* (Matschie). Ruaha River, German East Africa.
16. *Syncerus schillingsi* (Schillings). Pangani, German East Africa.
17. *Syncerus thierryi* (Matschie). Togo, West Africa.
18. *Syncerus wiesei* (Matschie). Between Loangwa and Revuga rivers, north of Zambese River.
19. *Syncerus wembarensis* (Matschie). Tschaja Swamp, southern Wembere Steppe.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW SWIFT FROM PALESTINE.

BY OUTRAM BANGS.

The well-known Selah Merrill collection of birds from Palestine was acquired by the Museum of Comparative Zoölogy in July, 1909. In the species and subspecies of the region, except for a few very rare or local forms, it is complete, and most of the species are represented in long series. Though many skins are from other places, and a number were got for him by Arabs, the collection was principally made in the vicinity of Jerusalem during the years 1884–1886 by the late Rev. Dr. Merrill himself.

Some day I hope to publish a catalogue of it, with such notes as were kept by Dr. Merrill in his register, though these in many cases, I am sorry to say, are not entirely satisfactory.

The forms that have long been recognized as peculiar to Palestine and the ones recently described by Hartert during the progress of his "Vögel der Paläarktischen Fauna," appear to be all represented in the Merrill collection.

In the collection the swifts are represented by smaller series than usual, there being three skins of *Apus apus apus* (Linn.), three of *Apus affinis galilejensis* (Autin.), and two of the white-bellied swift. The latter are so very pallid and otherwise different from European specimens that I propose for the Palestine form the name,

Apus melba petrensis subsp. nov.

Type from the Jordan Valley, Palestine, no. 59,534, Coll. Mus. Comp. Zool. From the Selah Merrill Coll., taken in April, 1886, original no. "a. 108."

Characters.—Similar to true *A. melba* (Linn.) of Europe, but much

paler above and upperparts pale drab, lighter still on forehead and crown, the dusky marking in front of eye consequently very conspicuous; brown band across chest very narrow and the white throat patch large.

Measurements.—

No.	Wing.	Tail.	Tarsus.	Culmen.
59,534 Type	215	87	15.5	9
59,535 Topotype	219	87.5	16	9

Remarks.—Our two specimens, neither of which bears any sex mark, were in fully adult plumage, fresh and unworn, and their pallid coloring is not the result of fading.

Hartert, in Catalogue of Birds in the British Museum, Vol. XVI, p. 439, mentions some very pallid skins from the western Himalayas, and from Belgaum, and possibly the pale form described above has a wide breeding range.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SOME NEW NORTH AMERICAN IXODIDAE WITH NOTES ON OTHER SPECIES.

BY F. C. BISHOPP.

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In studying the collections of ticks that have accumulated in the collection of the Dallas Laboratory several new species have been discovered, and in order that the biological notes on these forms to be published later may not contain descriptions of new species these descriptions are presented here.

I wish to express my sincere thanks to Mr. Nathan Banks for the many helpful suggestions given and for his kindness in placing at my disposal the collection of the Bureau of Entomology and of the National Museum, and the collection of the late Doctor Marx, as well as specimens from his private collection. My thanks are also due to Doctor L. O. Howard and Mr. W. D. Hunter for courtesies extended in the course of my work and to Messrs. G. N. Wolcott and H. P. Wood, the former for making the drawings used in illustrating this paper, the latter for assistance in the rearing of specimens received at the laboratory in the immature stages and in the care of all collected material received by him.

Ixodes cookei var. **rugosus** n. var.

Female.—Capitulum (Fig. 1), length 760 μ (from tip of hypostome to a line drawn between tips of postero-lateral angles of basis capituli); basis capituli dark reddish brown, borders almost black, rather wide (560 μ); postero-lateral angles not prominent, basal border incurved at center; surface, especially around porose areas, roughened; porose areas large, somewhat triangular, reaching very near to posterior margin of basis

capituli; slightly broader than long and separated by about half their length; the space between them with a pronounced rather irregular groove; palpi 574 μ long, rather broad and heavy, entire surface roughened; third segment slightly longer than broad.

Scutum, length 1.44 mm., width 1.41 mm.; reddish brown, broadest slightly in front of the middle, broadly rounded behind; lateral carinae present but not well defined, extending back a little behind widest part of shield but not reaching the shield margin; cervical grooves moderately distinct, extending back to middle of scutum; surface of scutum closely covered with large deep punctures, more scattered toward tip, in regions of cervical grooves and lateral carinae they are somewhat confluent, forming rugose areas.

Legs light reddish brown, translucent, rather long and stout, all tarsi abruptly narrowed near tips, all coxae with a short posterior apical tooth and with a trace of a tooth at the anterior apical angle; coxae I with a long spine at base, slightly shorter than in *I. cookei*.

Stigmal plates rather small, transversely oval, 330 μ x 287 μ and 344 μ x 273 μ; about 108 goblets per plate, irregular in size, some rather large, not closely crowded together, six rows between the macula and marginal cells at the widest point; macula nearly circular, located slightly antero-ventrally from center; marginal cells large, nearly circular.

Body pale yellow (slightly engorged), finely striate and with a few very short pale hairs; postero-median groove shallow, running from near posterior margin to a point opposite anus; accessory grooves deep and broad, running from near posterior margin nearly to shield, almost straight behind, irregular in front; anal frame about two and a half times as long as broad, sides nearly parallel, somewhat pointed in front of anus.

Male.—Capitulum (Fig. 2), length 502 μ (from tip of chelicerae (closed) to line connecting postero-lateral corners of basis capituli); basis capituli very dark brown, posterior and lateral edges black, greatest width at base of palpi (358 μ) only slightly narrowed toward basal margin where the width is 301 μ; the postero-lateral angles are not produced; the basal margin only very slightly concave; dorsal surface of basis capituli distinctly rugose and with a few punctures; ventrally it has a semi-circular ridge curving backward from near the base of each palpus, behind this it is distinctly narrowed; palpi very short and broad (330 μ x 187 μ); third segment but very little shorter than the second.

Scutum, length 2.75 mm., width 1.54; very dark brown, some parts almost black; sides nearly parallel, broadly rounded behind, less so at anterior end; the entire surface, with the exception of a few small areas along the median line, closely covered with large punctures, at anterior end these are somewhat confluent, producing rugosity; a few very short pale hairs near edges of scutum; cervical grooves deep and short; accessory grooves shallow; a series of broad depressions at intervals from the anterior ends of accessory grooves to near the cervical angles where surface of scutum is decidedly uneven.

Legs moderately long and stout, reddish brown, somewhat punctate; coxae I with a basal spine of medium length, shorter than in *I. cookei;* all coxae with minute apical teeth.

Stigmal plates nearly round, 330 μ wide by 301 μ long; about 135 goblets, of medium size, closer together and more uniform in size than in female; about seven rows between macula and marginal cells at widest point; macula broadly oval, located ventro-anteriorly from center; a distinct depression running around macula on antero-ventral side; marginal cells circular, smaller than in female.

Body with marginal strip on dorsum, somewhat lighter than scutum; finely punctate and with many very short yellow hairs; venter dark brown somewhat mottled with light brown, punctate over its entire surface; the chitinized plates exceedingly closely covered with very large punctures and with a few very short hairs; edges of post-genital plate rugose; anal groove straight (transverse) in front of anus; length of this portion of groove 215 μ, length of anal frame 932 μ; sides of anal frame slightly curved and strongly divergent behind anus.

Type, Cat. No. 13,973, U. S. National Museum.

Type host.—Dog.

Type locality—Tiller, Oregon.

Described from a female and male of a lot of two females and six nymphs (one of which was engorged and molted to a male) collected March 28, 1910, by Mr. S. S. Stevens. Dallas Acc. No. 1316.

The collection of the Bureau of Entomology at Dallas, Texas, contains the following lots of specimens, taken on dogs, which are referred to this variety:

Two ♀, Beatrice, Cal., March 2, 1910 (J. Sawyer); 1 ♀ and 2 nymphs, Hemlock, Oregon, March 28, 1910 (Chas. Desmond); 4 ♀, 1 nymph, 1 larva, March 27, 1910; 5 ♀, 4 nymphs, May 5, 1910; 1 ♀, May 23, 1910; 1 ♀, July 1, 1910; 1 ♀, 1 nymph, November 29, 1910; 10 nymphs, December 9, 1910; all from Pysht, Washington, collected by Mr. Guy Decker; 1 ♀, 9 nymphs, Sightly, Washington, September 21, 1910 (B. A. Bruce); the series of females shows but slight variations from the type. In some, the punctures over the entire scutum are more or less confluent, making the surface longitudinally rugose. In some, the capitulum and palpi are more distinctly roughened than in the type.

The females of this variety are separated from those of *I. cookei* proper by the porose areas being as long as broad, more triangular in outline, and somewhat closer together; also by the roughened capitulum and shield. The latter is rather less narrowed behind the middle than in *cookei*.

The male is easily distinguished from the males of *cookei* and other species by the large punctures which closely cover almost the entire body and scutum. As compared with *I. cookei*, the male is darker in color, sides of body more nearly parallel, basal spines on coxae I shorter, and stigmal plates slightly smaller.

Ixodes banksi n. sp.

Female.—Capitulum (Fig. 3), length 689 μ (from tip of hypostome to posterior edge of basis capituli on dorsum); basis capituli narrow, greatest width (452 μ) at base of palpi where the basis capituli is somewhat extended to form a socket for their reception; dark yellowish brown, posterior margin almost black, postero-lateral angles scarcely visible; ventrally, basis capituli shows two broad flat processes at the base of each palpus; porose areas rather large, well defined, about as long as broad, extending close to posterior margin, separated by about one-half their length; between them is a narrow groove or depressed line; palpi lighter in color than basis capituli; length 474 μ, greatest width 158 μ; third segment slightly longer than broad; second segment nearly twice as long as third; first segment rather long and without prominent ventro-lateral process.

Scutum (Fig. 4), length 1.14 mm., width 1.01 mm., reddish brown, moderately narrowed behind, postero-lateral margins not concave; lateral carinae present but not strong; cervical grooves moderately distinct beginning some distance behind cervical angles, first converging then diverging so as to form an angle at the point where they are nearest together; surface irregularly covered with punctures of different sizes, mostly rather large; also with a few yellow hairs.

Legs amber in color, long and rather slender; tarsi not abruptly narrowed at tips; all coxae (Fig. 5) with a distinct blunt spine at apex; coxae I with a rather long and moderately slender basal spine; coxae II with a trace of a basal spine.

Stigmal plates (Fig. 6) exceedingly large, slightly broader than long (509 μ x 466 μ); about 440 goblets per plate, small and very closely crowded together, even near macula, around which there is but a small area without goblets; about 15 rows of goblets between macula and marginal cells at widest point; marginal cells small and close together, only slightly flattened laterally; macula oval, located comparatively close to the antero-ventral border, slightly elevated above area immediately surrounding it, which area is concave.

Body dark reddish brown, finely striate and minutely punctate, well covered with moderately short, yellow hairs; marginal groove distinct, running from near the lateral angles of shield well around curve of body at posterior end; postero-median groove broad and shallow, extending from near posterior margin half way to posterior end of scutum; accessory grooves deep and broad, curved, slightly longer than the postero-median; venter with hairs as on dorsum; anal groove deep; anal frame slightly pointed in front of anus, sides nearly parallel; entire frame one-fourth as wide as long.

Type, No. 13,974 U. S. National Museum.

Type host.—Muskrat (*Fiber zibethicus* Linn.).

Type locality.—Mammoth Springs, Arkansas.

A female described from a lot of 15 females and 7 nymphs collected June 14, 1910, by Mr. A. H. Howell (Dallas Accession No. 1833); named

for Mr. Nathan Banks, the principal contributor to our systematic knowledge of the ticks of North America.

This species would run to *I. cookei* or *I. sculptus* in Mr. Banks' table in his Revision. However, it is easily separated from those species by the much larger stigmal plates and somewhat shorter basal spine on coxae I. The dimensions of the stigmal plates of *I. cookei* vary from 330 μ x 287 μ to 467 μ x 412 μ. There are six or seven rows containing 120 to 150 goblets. The dimensions of the stigmal plates of *I. sculptus* are much smaller than in *I. cookei* and the number of goblets fewer. The shape of the basis capituli and porose areas is markedly different from *I. sculptus* and the lateral carinae are not distinct and incurved as in that species. The basis capituli is much narrower than in *I. cookei* and the postero-lateral angles are less prominent than in that species.

The specimens at hand are very uniform in most characters; the width of the basis capituli varies from 416 μ to 439 μ, and the size of the stigmal plates from 502 μ x 445 μ to 560 μ x 504 μ, and the number of goblets from about 440 to 500 per plate. The length of the first tarsi varies from 574 μ to 653 μ. Some of the females in the lot were about one-third engorged; the bodies of these are light yellow and elongate.

Ixodes kingi n. sp.

Female.—Capitulum (Fig. 7), length 789 μ (from tip of hypostome to line connecting postero-lateral angles of basis capituli); basis capituli dark reddish brown, of medium size, width 574 μ; postero-lateral angles prominent; porose areas small, slightly broader than long, separated by nearly their width; outline well defined, pits large and deep; palpi very short and broad (488 μ x 244 μ), the greatest width occurring at the apex of the second segment; this segment is only slightly narrowed back to its basal articulation where it is abruptly constricted; first segment broad and deeply cut out dorso-laterally and bears a prominent, broadly rounded projection on its anterior margin ventro-laterally; ventrally the basis capituli is smooth and somewhat narrowed posteriorly.

Scutum (Fig. 8), length 1.34 mm., width 1.2 mm., reddish brown, darkest anteriorly, greatest width at about one-third of the distance from anterior angles, distinctly narrowed behind, the postero-lateral margin being slightly concave; lateral carinae strong, running nearly to margin, slightly behind middle of scutum; scutum distinctly depressed for the entire length of the lateral carinae immediately mediad of those carinae; surface of scutum densely and rather evenly covered with coarse punctures.

Legs amber in color, short and rather slender; tarsi abruptly narrowed near apex; all coxae (Fig. 10) with a distinct apical tooth; coxae I with a moderately long, stout basal spine.

Stigmal plates (Fig. 9) rather small, 287 μ x 244 μ, transversely oval, about 96 goblets per plate, medium sized, not crowded together; a considerable area postero-ventrally from macula without goblets; goblets

arranged in irregular concentric rows; five rows between the macula and marginal cells at the widest point and two rows at the narrowest; marginal cells much smaller than goblets, close together and somewhat rectangular; macula oval, slightly elevated above smooth area surrounding it; this area is depressed slightly below the goblet covered portion.

Body pale yellow, punctate, rather densely covered with moderately short pale yellow hairs; genital aperture opposite coxae III; anal groove broadly round in front of anus and divergent behind it; anal frame about one-half as broad as long.

Male.—Capitulum (Fig. 11), length 517 μ (from tip of hypostome to a line connecting postero-lateral angles of basis capituli); basis capituli dark brown, greatest width at base of palpi (416 μ) slightly narrowed from this point to posterior angles which are 301 μ from center to center; these angles prominent; on the ventral side of the basis capituli is a nearly semi-circular ridge curving backward from near the base of each palpus where it is very prominent; palpi very short and broad (length 351 μ, width 194 μ); the third segment broader than long, the second nearly as broad as long.

Scutum, length 2.58 mm., width 1.28 mm., brownish yellow, darker in front over an area corresponding to the shield in the female, sides nearly parallel, broadly rounded behind; surface shiny with a very few short pale hairs, closely covered with large deep punctures at anterior end, these become small and more scattered posteriorly to the middle of the shield where they disappear; the posterior half of the scutum has a few exceedingly minute punctures; lateral carinae strong, running from angles of capitular emargination to edge of scutum one-fifth of its length back; as in the female, shield is depressed immediately mediad of the lateral carinae; cervical grooves indistinct, shorter than lateral carinae, only distinctly visible toward their posterior ends.

Legs (Fig. 12) moderately short and rather slender, yellowish brown; tarsi III and IV gradually tapering at tip, others rather abruptly narrowed; all coxae with a distinct apical tooth and coxae I with a short stout spine (about 86 μ long).

Stigmal plates longitudinally oval (287 μ x 251 μ); 90 goblets per plate, medium sized and rather more scattered than in female; arranged in concentric rows, five rows at the widest and two at the narrowest point between the macula and marginal cells; a much smaller area is left without goblets around the macula than in the female; marginal cells about one-half the size of the goblets and somewhat rectangular; macula oval, situated ventro-anteriorly from center.

Body (Fig. 12), marginal strip around scutum extends forward to opposite second pair of legs, pale yellow, punctate and with numerous short pale hairs; venter yellow, plates highly chitinized and without punctures except the lateral ones (which have the stigmal plate located at their anterior end), the punctures on these lateral plates are moderately large and close together along their outer halves, the inner halves are free from punctures except a few ventrally from the stigmal plates; anal groove straight (transverse) in front of anus, the length of this

portion of the groove being 215 μ; behind the anus the anal groove is nearly straight and strongly divergent; length of anal frame 789 μ.

Type, Cat. No. 13,975, U. S. National Museum.

Type host.—Badger (*Taxidea taxus* Schreber).

Type locality.—Meeteetse, Wyoming.

A female and male described from a lot of 16 females, 13 males, 9 nymphs and 14 larvae collected July 10, 1909, by Mr. W. V. King (Dallas Accession No. 621) for whom this species is named.

The collection of the Bureau of Entomology contains 1 ♀ on *Thomomys*, Walker Pass, Cal., July 1, 1891 (Dr. A. K. Fisher); 2 ♀ on prairie dog, Sherwood, Texas, November 2, 1906 (F. C. Pratt); 1 ♂, 1 ♀ on badger, 1 ♀ on wolf, 1 ♀ on skunk, Sabinal, Texas (F. C. Pratt and C. T. Atkinson); 5 ♂, 5 ♀ on badger, Fairview, New Mexico, October 2, 1909 (E. A. Goldman); 6 ♂, 13 ♀ on dog, Cedarview, Utah (W. F. Fishback); 2 ♀ on mink, Randlett, Utah (E. P. Ford); 7 ♀ on dog, Sunnyside, Idaho (E. H. Raymond); 1 ♀ on *Thomomys c. ocius* and 1 ♀ on *Perodipus richardsoni*, both from Sun, Wyoming (M. Cary); 1 ♀, Sheridan, Wyoming (Cecil Lowman); 1 ♂, 2 ♀, Lost Cabin, Wyoming (Dr. P. H. Shallenberger); 1 ♂, 13 ♀ on dog, Hyattsville, Wyoming (J. R. Matthews); 1 ♀, Mt. Shaw, Montana; four lots, one of which contained both sexes, on dog, Garneill, Montana (H. McLaughlin); 1 ♀ on a Spermophile, Garneill, Montana (H. McLaughlin); two lots of 1 ♀ each on dog, Chauteau, Montana (G. M. Carson); two lots of 1 ♀ each on dog, Conrad, Montana; 1 ♀, Townsend, Montana (W. D. Neild); 1 ♀ on *Marmota flaviventer*, Florence, Montana (W. V. King).

The first two lots (from Walker Pass, Cal., and Sherwood, Texas) were placed by Mr. Banks with *Ixodes pratti* Banks (A Revision of the Ixodoidea, 1908, p. 28). I have examined the type of *I. pratti* and find it to be distinct from the specimens from Walker Pass, Cal., and Sherwood, Texas. The tooth beneath the rostrum at the base of each palpus is sufficient to separate the species. The first coxae spine is shorter in *pratti* and no postero-lateral angles are present on the basis capituli. Mr. Banks' drawings of *I. pratti* appear to have been made in part from the specimen from Sherwood, Texas (*I. kingi*) as the drawing of the capitulum does not agree with the type. The female from Sherwood was probably drawn on account of the poor condition of the type.

Ixodes kingi is most closely related to *I. cookei*, but is readily distinguished from that species by the following characters: shorter, more slender legs; smaller capitulum; much smaller and more widely separated porose areas; distinct lateral carinae; shield more narrowed behind; spine at base of coxae I less than one-half the length of that in *I. cookei;* stigmal plate much smaller than in *cookei*.

In a large number of females of *I. kingi* the stigmal plate averages 294 μ x 258 μ while in a number of females of *cookei*, the stigmal plate averages 418 μ x 360 μ. In *kingi* the goblets are more widely separated and do not exceed five rows at the widest place, the total number not exceeding 96, while in *I. cookei* there are seven or eight rows and at least 122 goblets per plate.

The engorged females are almost globular, the length and width differing but very little. In this respect this species is unlike other members of this genus.

The males may be distinguished from those of *cookei* by the basal spine on coxae I being much shorter (less than one-half the length); the entire tick smaller; sides of shield parallel; absence of punctures on posterior half of shield; presence of well-defined lateral carinae; shorter and broader palpi; shorter, smaller legs; smaller stigmal plates; absence of punctures on the ventral plates; width of anal frame in front of the anus much greater.

Nearly all of the other specimens at hand have rather shorter and more slender legs and shorter basal spine on coxae I than the type and paratypes. The scutum, in a number of specimens, is somewhat smaller than the type. The lateral carinae are distinct in all specimens.

Ixodes angustus Neum.

This species is abundant in various parts of the Northwest. The specimens at hand show no decided variation, although some have the porose areas less triangular and the scutum rather shorter and broader than typical. It is worthy of note that out of thirteen lots of adults of this species collected from hosts, only one contained male specimens. The thirteen lots contained forty females and two males. Certain data relating to specimens obtained by the Bureau in connection with the work conducted on the Rocky Mountain spotted fever tick may be of interest on account of their bearing on host relationship, distribution and seasonal occurrence of the species. The material is contained in the collection of the Bureau of Entomology at Dallas, Texas. During 1909 the following collections were made: 2 ♀, 3 nymphs and 3 larvae from *Ochotona princeps*, Meeteetse, Wyoming, July 7 (W. V. King); 1 ♀ from *Neotoma orolestes*, Casper, Wyoming, August 30 (M. Cary); 2 ♀ from *Eutamias townsendi*, Detroit, Oregon, October 3 (V. Bailey); 6 ♀ and 3 nymphs from *Sciurus mollipilosus*, Empire, Oregon, October 12 (V. Bailey); 14 ♀ from *Sciurus mollipilosus*, Empire, Oregon, October 16 (D. D. Streeter). The following collections were made during 1910: 2 ♀ from (*Sciurus h. douglassi*) Mt. Lehman, B. C., March 12 (Dr. Seymour Hadwen); 3 ♀ and 3 nymphs from (*Sciurus h. douglassi*) Silver Lake, Washington, April 7 (B. A. Bruce); 1 ♀ from *Sciurus sp.* Pysht, Washington, March 23 (Guy Decker); 2 ♀ from rabbit, Mora, Washington, June 13 (A. W. Smith); 2 nymphs from *Citellus columbianus*, Florence, Montana, June 16 (W. V. King); 1 ♀, 20 nymphs and 62 larvae from *Ochotona princeps*, Florence, Montana, June 16 (W. V. King); 1 ♀ from *Sciurus h. richardsoni*, Lo Lo Hot Springs, Montana, June 23 (W. V. King); 2 ♀, 7 nymphs and 2 larvae from *Ochotona princeps*, Lo Lo, Montana, June 29, (W. V. King); 1 ♀ from cat, Pysht, Washington, July 6 (Guy Decker); 2 ♂, 4 ♀ and 4 nymphs from rabbit, Pysht, Washington, August 30 (Guy Decker); 1 nymph from dog, Pysht, Washington, August 31 (Guy Decker).

It should be stated that the determinations of the immature stages are not absolutely certain owing to the difficulty of positively identifying the immature stages of Ixodes. In a few instances nymphs were bred to adult, and in the other cases I feel reasonably sure of the correctness of the determinations.

Ixodes angustus var. **woodi** n. var.

Female.—Capitulum (Fig. 13), length 680 μ (from tip of hypostome to a line drawn between postero-lateral angles of basis capituli), basis capituli dark brown, greatest width 416 μ; postero-lateral angles rather less prominent than in *I. angustus* proper; the basal border of capitulum slightly concave; porose areas small and not well defined, nearly semicircular with the flat side along the strong carinae which run toward the rostrum from the postero-lateral angles of the basis capituli; length of porose areas along these carinae is distinctly greater than their width; widely separated, the distance between them being nearly equal to their length; ventrally the basis capituli is very long, comparatively narrow, and smooth; distinctly longer and more narrow than in typical *I. angustus;* palpi similar to *angustus*, but the anterior portion of the first segment is distinctly produced ventro-laterally; hypostome less pointed at tip than in *angustus* proper.

Scutum, length 1.44 mm., width 1.07 mm., very similar to *angustus*, but rather more coarsely punctured and slightly more narrowed behind.

Legs as in *angustus*, but heavier; all tarsi are rather abruptly narrowed near tips; coxae I with a moderately long basal spine (longer than in *I. angustus*) and a large blunt apical spine; other coxae with distinct broad apical spines, smallest on posterior coxae.

Stigmal plates very small (179 μ x 158 μ), transversely oval, about 49 goblets per plate, medium sized; four rows at widest and one row at narrowest point between macula and marginal cells.

Body with numerous, moderately short, pale hairs; anal frame widest near posterior margin, narrowed anteriorly to a blunt point in front of anus.

Type, Cat. No. 13,976, U. S. National Museum.

Type host.—Baird's wood rat (*Neotoma micropus* Baird).

Type locality.—Sabinal, Texas.

A female described from a lot containing two females and three nymphs collected May 18, 1910, by Messrs. F. C. Pratt and C. T. Atkinson (Dallas Accession No. 1641).

Named for my associate, Mr. H. P. Wood.

The collection of the Bureau of Entomology at Dallas, Texas, contains the following material which I have referred to this variety: 2 nymphs, 2 larvae, February 7, 1910; 2 ♀ May 10, 1910; 2 ♀ May 20, 1910; 3 nymphs May 31, 1910. All collected at Sabinal, Texas, on *Neotoma micropus* Baird, by Messrs. F. C. Pratt and C. T. Atkinson.

No males were collected.

Ixodes sculptus Neum.

But a few specimens of this species have been collected and these come from widely separated localities.

The very narrow basis capituli, the incurved lateral carinae and small stigmal plates, differentiate it from the *Ixodes cookei* group. The somewhat elongate scutum, narrow capitulum, rather slender palpi and small stigmal plates indicate a relationship with *I. angustus*.

In the type specimen the greatest width of the basis capituli (at base of palpi) is 467 μ. The width between the centers of the postero-lateral angles, which are distinct and incurved, is 373 μ. The area bearing the porose areas is distinctly elevated above the lateral portions where the palpi articulate. This gives the appearance of still greater narrowness. The length of the capitulum from tip of palpi to postero-lateral angles is 747 μ. The stigmal plates are transversely oval and measure about 233 μ x 187 μ.

Mr. Banks' collection contains two partially engorged females collected by Prof. J. M. Aldrich at Brookings, South Dakota, which agree very closely with the type. In these two specimens the maximum widths of the basis capituli are 420 μ and 439 μ and the widths between the centers of the postero-lateral angles 327 μ and 355 μ respectively. In one of these specimens the stigmal plate measures 261 μ x 233 μ. The scutum of each is finely punctate and the lateral carinae strong and incurved at tips. But one of the specimens shows the depression between the porose areas. On account of the fact that many specimens of *cookei* have a more or less distinct scar between the porose areas, this character is of limited systematic value.

The collection of the Bureau of Entomology at Dallas, Texas, contains 1 ♀ from *Citellus columbianus*, Bozeman, Montana, March 20, 1910 (Prof. R. A. Cooley); 1 ♀, 4 nymphs and 5 larvae from wild cat, Wichita Mts., Oklahoma, December 21, 1909 (Frank Rush); 1 ♀ from striped ground squirrel, Luther, Wyoming, September 24, 1910 (C. O. Lyon); 1 ♀ from rock squirrel (*Citellus variegatus couchi* Baird) Devils River, Texas, May 4, 1907 (F. C. Bishopp).

The specimen from Montana agrees with the type very well, but the lateral carinae are not strong and are but little incurved at their tips. The greatest width of the basis capituli is 445 μ; the width between centers of postero-lateral angles is 337 μ. Stigmal plates have about 36 goblets each and measure 201 μ x 144 μ. The female from Oklahoma has the capitulum pulled off, hence the determination is doubtful. The scutum and legs agree closely with the type. However, the stigmal plates are larger (373 μ x 316 μ and 395 μ x 316 μ) and have many more goblets. The specimen from Wyoming is typical of the species, although the basal spine on coxae 1 is slightly shorter than the type. The greatest width of the basis capituli is 457 μ and the width between the centers of the postero-lateral angles 373 μ. The stigmal plates are very small, measuring 177 μ x 168 μ. The female from Texas is from the same lot which Mr. Banks examined and placed under *I. sculptus* in his Revision. This

specimen varies more from the type than the others herein listed. The greatest width of the basis capituli is 660 μ and the width between the centers of the postero-lateral angles is 502 μ. The porose areas are rather smaller than in the type and do not reach to the posterior border of the basis capituli. The legs are longer and stouter than in the type. The stigmal plates measure about 316 μ x 273 μ.

Haemaphysalis chordeilis Packard.

In the course of the studies of the life histories of ticks being conducted by the Bureau of Entomology three lots of ticks were collected which contain males of this species. In three instances we have reared to adult males, specimens collected as nymphs. The three above mentioned collections which contained males were made by Mr. J. D. Mitchell in Victoria County, Texas. The collections were made on meadow larks on the following dates; November 12, 1909 (1 ♂, 4 ♀), November 25, 1909 (5 ♂, 4 nymphs, 23 larvae), March 23, 1910 (1 ♂).

Since the male of this species has not been described, the following characterization is given:

Capitulum from 416 μ to 488 μ long (from tip of palpi to tip of postero-lateral angles of basis capituli); basis capituli from 287 μ to 344 μ wide, amber in color, rectangular, postero-lateral angles short but well defined, center of dorsal surface with a number of punctures; palpi amber in color, length from 258 μ to 316 μ; first and fourth segments very small; second segment produced laterally and ventrally to form a prominent but not acute angle; a few scattered yellowish bristles on palpi; the infra-internal edges bear a number of feather-like bristles; hypostome rather blunt with five rows of moderately small teeth.

Scutum covers all of dorsum but a narrow marginal strip, light gray in color, shading into amber anteriorly; glaborous, shining rather thickly and coarsely punctured, some specimens showing a small rugose area at antero-lateral angles; fovae nearly black opposite or slightly posterior to fourth pair of legs; cervical grooves deep anteriorly, first converging, then diverging and disappearing posteriorly; postero-median groove distinct, deepest at posterior end; accessory grooves shallow and broad; marginal groove deep, extending from a point opposite the second pair of legs to the fourth festoon.

Legs yellowish brown, translucent, with numerous light yellow hairs; trochanters I with prominent blade-like process projecting backward; tarsi all tapering rather abruptly to end; coxae slightly darker than legs, with numerous yellow hairs; coxae I, II and III with very short, blunt basal spurs; coxae IV with a rather long, blunt spur.

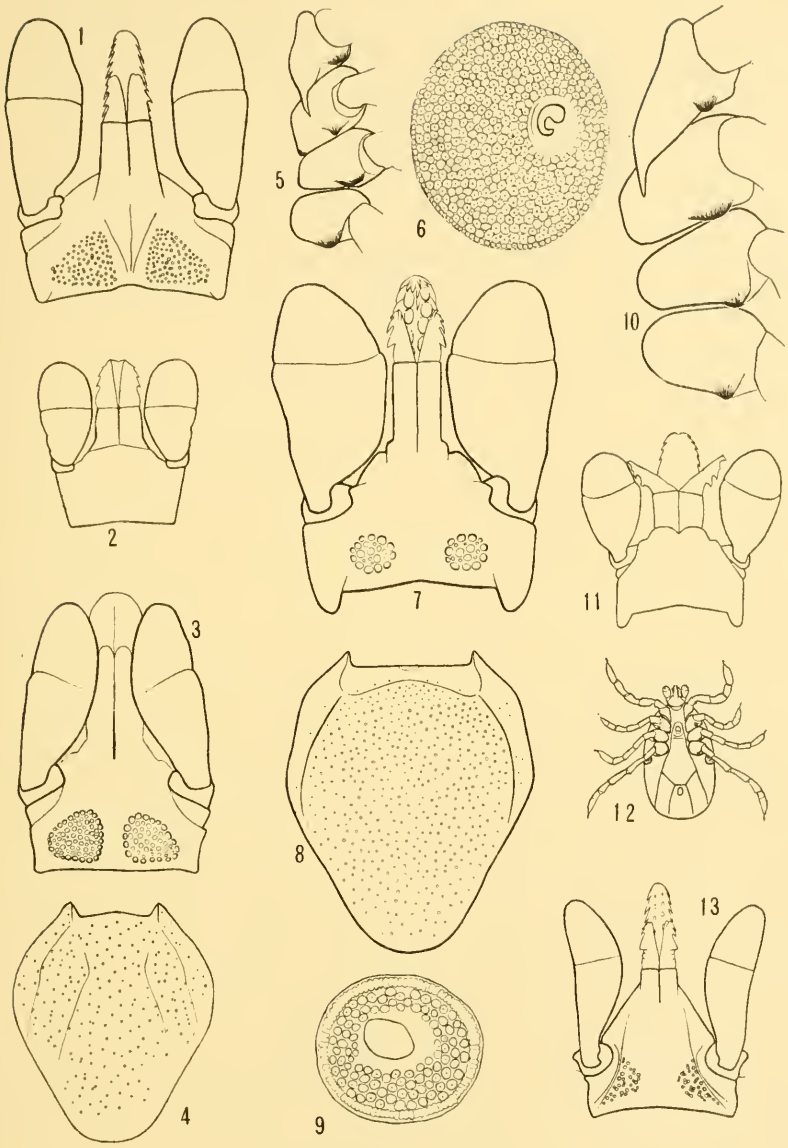
Stigmal plates broadly oval, sides nearly parallel for some distance; with a short, broad dorso-posteriad prolongation; size from 358 μ long x 287 μ wide to 373 μ long x 230 μ wide (width includes prolongation); macula small, situated toward antero-internal angle, rather closely covered with many moderately small goblets of nearly uniform size.

Body ellipsoidal in contour, widest posteriorly; marginal strip of dor-

sum milk color; this color also occurs along the festoon grooves; festoons brownish slate color with punctures similar to those on scutum; venter gray blue; festoons brownish with yellow centers; genital groove distinct, almost parallel anteriorly, diverging behind posterior coxae and extending to a point on the marginal furrow between the second and third festoons; post-anal groove straight, forming a Y at its anterior extremity, the forks of which extend forward on either side of the anus. Total length of specimens from 2.8 mm. to 2.9 mm., width from 1.5 mm. to 1.6 mm.

Described from several living males collected in Victoria County, Texas. Dallas Accession Nos. 886 and 1012.

The specimens at hand show a slight variation in the shape of the stigmal plates and basis capituli.



Explanation of Plate

Ixodes cookei var. *rugosus*, Fig. 1, capitulum of female; Fig. 2, capitulum of male.

Ixodes banksi, Fig. 3, capitulum of female; Fig. 4, scutum of female; Fig. 5, coxae of female; Fig. 6, stigmal plate of female.

Ixodes kingi, Fig. 7, capitulum of female; Fig. 8, scutum of female; Fig. 9, stigmal plate of female; Fig. 10, coxae of female; Fig. 11, capitulum of male; Fig. 12, ventral of male.

Ixodes angustus var. *woodi*, Fig. 13, capitulum of female.

Drawn by G. N. Wolcott. (Original.)

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SOME NOTES ON FISH SCALES.

BY T. D. A. COCKERELL.

Last summer, thanks to the Bureau of Fisheries, I was enabled to continue my work on fish scales at Woods Hole, where I obtained much interesting material not previously available. Thanks to Dr. F. B. Sumner, Dr. Hugh M. Smith, Dr. B. W. Evermann and others, I have before me a remarkable collection of fish scales, which will form the subject of a report later on. In the meanwhile, the following notes are offered. They were written and sent for publication before I knew how much material I was to obtain, or that means would be found for the publication of a detailed illustrated report.

PLEURONECTIDÆ AND SOLEIDÆ.

The following table will serve for the separation of the scales of a series of flat-fishes, all in the collection of the Bureau of Fisheries Station at Woods Hole, except *Platophrys constellatus*, which is from the collection of the Bureau in Washington.

A. Scales ctenoid on both sides (Soleidæ).

Apical teeth large and few (6 or 7 on upper, 3 to 5 on lower side), with a well-marked zone of large reticulations at their base . *Achirus lineatus* (L.).

No such zone of reticulations at the base of the teeth . . . . . 1.

1. Scales narrow, with 8 to 20 basal radii . . . . . *Solea solea* (L.).

Scales larger and broader, with over 30 basal radii . . . . . *Symphurus piger* (Goode and Bean). Gulf Stream.

Of these, the *Achirus* must be considered the most modified. The three genera represent the subfamilies Achirinæ, Soleinæ and Cynoglossinæ.

B. Scales ctenoid above, cycloid on the lower (blind) side (Pleuronectidæ).

Scales large, minutely ctenoid above . . . . . 1.
Scales minute . . . . . 2.
1. Lateral areas with very fine radiating striæ . *Syacium papillosum* (L.). Albatross Sta. 2405.
Lateral areas without such striæ . . . *Citharichthys arctifrons* Goode.
2. Basal radii so many and close as to produce the effect of a fine striation; scales broad . . . . . 3.
Basal radii not thus numerous . . . . . 4.
3. Apical teeth of scales on upper side of fish projecting beyond margin . . . . . *Platophrys constellatus* Jordan. Magdalena Bay (Albatross).
Apical teeth of scales on upper side submarginal; so that the scales seem cycloid . . . . . *Platophrys ocellatus* Agassiz. Albatross Sta. 2414.
4. Basal radii many, about 15–20 on lower, over 20 on upper side; teeth of ctenoid scales few (about 5 to 7) and very sharp . . . *Pseudopleuronectes americanus* Walb.
Basal radii fewer . . . . . 5.
5. Lateral areas, free from radii, extensive, their circuli dense . . *Notosema dilectum* Goode and Bean.
Lateral areas, free from radii, small . . . . . 6.
6. Scales smaller, radii more parallel . . . . *Limanda ferruginea* Storer.
Scales larger, radii less parallel . . . . . *Hippoglossoides platessoides* Fabricius.

The last two are nearly alike.

C. Scale cycloid on both sides (Pleuronectidæ).

Scales very small, long-oval, basal radii few . . . . . *Glyptocephalus cynoglossus* L. Albatross Sta. 2546.
Scales much broader, basal radii many . . . . . 1.
1. Scales smaller; those of lower side about half size of those on upper . . . . . *Lophopsetta maculata* Mitch.
Scales larger; those of lower side not so much smaller than those of upper . . . . . *Paralichthys oblongus* Mitch.

The *Glyptocephalus* scale is the most modified (degenerate) of the whole series. Some Achirinæ (not seen by me) are scaleless. With regard to the subfamilies of Pleuronectidæ, it will be noted that each subfamily has produced a genus with cycloid scales on both sides.

It is is obvious that the flat-fishes are descended from fishes with the typical Acanthopterygian (ctenoid) type of scales, and that the cycloid scales have arisen through loss of the ctenoid character. From all we know about inheritance, it appears practically certain that this character, once completely lost on the lower side, would not return in the well-developed condition in which it occurs in the soles. It must, therefore, be held that the Soleidæ are not derived from the ordinary Pleuronectidæ, but rather from some ancient type of flat-fish, probably now without living representatives. There is, however, a living genus of Pleuronectids

having ctenoid scales on both sides like the soles, namely *Ancylopsetta*, said to be very close to *Paralichthys*.*

I had reached these conclusions from the scales, when I fortunately met Professor G. H. Parker, and mentioned them to him. He at once kindly directed my attention to his paper on the optic nerves of flat-fishes, published in the Bulletin of the Museum of Comparative Zoology, Vol. XL (1903). In this work he shows that the condition of the optic chiasma in the Soleidæ is as in ordinary Teleosts, whereas in the Pleuronectidæ it is modified. He therefore concluded that "the Soleidæ are not degraded Pleuronectidæ, but degenerate descendants of primitive flat-fishes, from which the Pleuronectidæ have probably been derived." The Soleid genera examined by Professor Parker were the same as mine; his Pleuronectids were *Atheresthes*, *Eopsetta*, *Hippoglossoides*, *Psettichthys*, *Paralichthys*, *Hypsopsetta*, *Parophrys*, *Isopsetta*, *Oncopterus*, *Limanda*, *Pseudopleuronectes*, *Pleuronectes*, *Liopsetta*, *Glyptocephalus*, *Lophopsetta*, *Platophrys*, *Syacium*, *Azevia*, *Citharichthys*, *Etropus*. Unfortunately, he did not see *Ancylopsetta*, but it seems very unlikely that it would depart from the condition he found in all the other genera.

GADIDÆ AND ALLIES.

The table below separates the scales of a number of Gadoids, the specimens all from the Bureau of Fisheries Station at Woods Hole, except the Macrouridæ, which are (except *Macrourus* sp.) from the U. S. National Museum.

A. Apical field of scales with long spines (Macrouridæ).

Basal circuli sharply angulate in the middle . . . . . 1.

Basal circuli not sharply angulate . . . . . 2.

1. Apical teeth shorter, densely set, no circuli visible between them *Macrourus bairdii* Goode and Bean.
   Lat. 39.53 N., Long. 70.9 W. (Albatross).

   Apical teeth longer, not densely set, circuli very conspicuous between them . . . . . *Macrourus* sp.
   Albatross Sta. 2426.

2. Scale very broad and short; teeth very long, many projecting far beyond margin . . . . . *Coryphænoides rupestris* Gunner.
   (Albatross.)

   Scale not greatly broader than long; teeth shorter, not or hardly projecting beyond margin . *Coelorhynchus caribbæus* (Goode & Bean).

These scales must be called ctenoid, yet the margin itself is not dentate, except slightly in *Macrourus* sp. The scales of *Capros*, as figured by Goodrich, have similar teeth; *Capros* is, of course, an entirely different fish.

*Jordan & Evermann, Bull. 47, U. S. N. M., Part III, p. 2634. In this work the scales of *Paralichthys oblongus* are said to be "weakly ctenoid or cycloid." Those examined by me are strictly cycloid.

B. Scales cycloid, wholly without spines (Gadidæ and Merlucciidæ).

a. Scales without radii (Merlucciidæ, Phycinæ, Gaidropsarinæ).

Scales elongate, with a strong median transverse furrow, variously developed, sometimes only near the margins, never crossing the nucleus; circuli not angled . . . . *Enchelyopus cimbrius* (L.). Eel Pond, Woods Hole.

Scales larger, rather broad, without such a distinct median furrow, and with the basal circuli variously angled . . . . . 1.

1. Region above the nucleus (except in latinucleate* scales) conspicuously finely pitted . . . . . *Merluccius bilincaris* (Mitchell). Woods Hole, Mass.

Region above the nucleus not or hardly pitted . . . . . *Urophycis regius* (Walb.). Woods Hole, Mass.

b. Scales with numerous radii (Gadinæ, Brosminæ).

Scales very long and narrow (about 4 mm. and 1½ broad), the central area usually free from sculpture and the fine radii broken . . . . . *Brosme brosme* (Müll.)

Scales not so long and narrow, usually with a fine reticulated sculpture all over, though latinucleate scales of *Microgadus* resemble those of *Brosme* in structure though not in shape . . . 1.

1. Scales comparatively large, about 7 to 8 mm. long and 4 to 5 broad . . . . . *Melanogrammus æglefinus* (L.).

Scales smaller, less than 5 mm. long . . . . . 2.

2. Scales smallest (about 2 mm. long), narrow . *Pollachius virens* (L.). Woods Hole.

Scales medium (between 3 and 5 mm.) . . . . *Gadus callarias* L. and *Microgadus tomcod* (Walb.).

The scales of the Macrouridæ, except for the shape (round or transversely elongate) and the spines, agree with those of the Merlucciidæ and Phycinæ, having more or less angled circuli and no radii. Those of the Gadinæ and Brosminæ are entirely different, and could not have been derived from those of the others. According to the scales, some type allied to the Macrouridæ may have given rise to the different lines represented by *Merluccius*, *Urophycis* and *Enchelyopus*; but the Gadinæ with the Brosminæ must have another origin, although no doubt all can be referred to a common ancestor by going back far enough. There is no essential difference between the Gadine and Brosmine scales, but in my preparation of *Brosme* all the scales are latinucleate except one.

* Latinucleate scales are those in which the nuclear region is broadly modified, the normal sculpture largely suppressed or altered, and the radii more parallel. This dimorphism is of general occurrence among fish scales, and appears to be due to regeneration after loss of the original scales.

CYPRINIDÆ.

The following interesting species are described from the collection of the Bureau of Fisheries at Washington and (*Algansea* and *Lepidomeda*) the National Museum:

(1.) *Algansea sallaei* (Günther). Scales oblong, subquadrate, nearly parallel-sided, slightly over 2 mm. long, about $1\frac{3}{5}$ wide; nucleus subbasal; radii all around; apical radii about 10 or 12, the interradial circuli very widely spaced. This is one of the few American Cyprinids having basal radii; the scales are not unlike those of *Temeculina*. The fish is from Guanajuato, Mexico (A. Dugès).

(2.) *Mylocheilus caurinus* (Richardson). Snake River, Idaho (Evermann). Large scales, about $5\frac{1}{3}$ mm. long and 5 broad; nucleus subbasal; no basal radii; apical radii about 25 or more; apical circuli widely spaced, not at all angulate in middle; very obtuse laterobasal angles. Except for the non-angulate apical circuli, this reminds one of *Semotilus*.

(3.) *Richardsonius siuslawi* (Evermann & Meek). Siuslaw River, Oregon (S. E. Meek). Scales quite normal for the typical subgenus *Richardsonius;* apical radii about 18, some imperfect.

(4.) *Exoglossum maxillingua* (Le Sueur). Roanoke, Va. Scales about $2\frac{1}{2}$ to $2\frac{3}{4}$ mm. long and broad; nucleus subbasal; no basal radii; apical radii about 20; apical circuli widely spaced, not angled; laterobasal angles evident but obtuse. The structure is almost as in *Mylocheilus*.

(5.) *Lepidomeda vittata* Cope. Colorado Chiquito River. *Transversely* oval scales, with the usual subbasal nucleus; apical radii about 7, strong; no basal radii; apical circuli extremely widely spaced. These scales are quite different from those of *Gila*, a fact useful for the separation of the fishes from juvenile *Gila*, occurring in the same region.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW TEAL FROM THE ANDAMAN ISLANDS.

BY J. H. FLEMING.

While cataloguing a number of birds from the Andaman Islands, collected in 1905, by Mr. B. B. Osmaston, and now in my collection, I noticed that in a series of twelve Andaman Teal, only five agreed with the description and plate of *Nettion albigulare* (= *Polionetta albigularis*) in Vol. 27 of the Catalogue of Birds. Six from North Reef Island (to the westward of North Andaman), and one from Middle Andaman differ sufficiently from the five from South Andaman to be described as a new subspecies, which may be known as—

Polionetta albigularis leucopareus subsp. nov.

Cotypes from North Reef Island, Andaman Islands, ♂ and ♀, collected by B. B. Osmaston, December 25, 1905. Fleming Coll. Nos. 19,064 (♂), and 19,069 (♀).

Characters.—Similar to *P. albigularis albigularis* (Hume), but averaging larger, with a great deal of white on head and neck; margins of body feathers cinnamon brown and better defined, producing strongly defined spots, especially on the sides of the breast.

♂. Pileum, except frontal apex, very dark brown, this color descending the sides of the face behind the auricular region, and partially surrounding it below; sides of upper neck light brown. Frontal apex and whole face, including eyebrows and auricular region, pure white, this color extending over the throat and lower neck, and continuing in a wide collar around the hind neck.

♀. Entire pileum dark brown becoming lighter on the sides of the head and neck, confining the white collar to the hind neck, and reaching forward below the auricular region. Auricular region, eyebrows, front of face, throat and lower neck as in the male.

TABLE OF MEASUREMENTS.
(Measurements in inches.)

Fleming Col. No.	Sex.	Date.		Wing.	Tail.	Tarsus.	Culmen.
			Polionetta albigularis leucopareus.				
19,065	male ad.	Dec. 25, 1905	North Reef Island, Andamans	8.20	3.23	1.45	1.35
*19,064	" "	" " "	" " " "	8.00	3.16	1.42	1.48
19,066	" "	" " "	" " " "	8.00	3.12	1.40	1.43
19,067	" "	" " "	" " " " †	7.42	3.03	1.45	1.49
19,068	" "	" " "	" " " " ‡	7.78	2.83	1.34	1.42
*19,069	female "	" " "	" " " "	7.91	2.88	1.40	1.50
19,075	(male) "	Jan. — "	North Andaman.	7.80	2.78	1.40	1.52
			Polionetta albigularis albigularis.				
19,073	male ad.	Dec. 10, 1905	Port Blair, South Andaman	7.60	2.80	1.32	1.47
19,071	" "	" " "	" " " "	7.38	2.88	1.37	1.37
19,072	female "	" " "	" " " "	7.70	2.57	1.40	1.37
19,070	" "	" " "	" " " "	7.48	2.61	1.31	1.35
19,071	" juv.	Oct. 10 "	Andamans	7.20	2.83	1.25	1.25

* Types. † All primaries in quill. ‡ First primary in quill.

Remarks.—I am indebted to Dr. L. B. Bishop, of New Haven, Conn., and Mr. W. R. Ogilvie-Grant for comparing two of my North Reef Island birds (the types) with the series of Andaman Teal in the British Museum and the types of *P. albigularis*, and both gentlemen agree that my form is at least a good sub-species. I have some hesitation in including the single bird from North Andaman in the new form; it is intermediate in coloring and is probably the connecting link between the forms.

The white on the frontal apex varies, being reduced to a line in that of the Reef Island birds, and one (19,065) has a great deal of white on the crown, 19,066 has a little, and 19,064 a small spot.

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PROCEEDINGS

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DESCRIPTION OF A NEW SUBSPECIES OF THE PAINTED BUNTING FROM THE INTERIOR OF TEXAS.

BY EDGAR A. MEARNS.

The Nonpareil, or Painted Bunting, of western Texas proves to be an undescribed race which may be named—

Passerina ciris pallidior subsp. nov.

PALE PAINTED BUNTING.

Type-specimen.—Adult male. Cat. No. 163673, U. S. N. M. Collected at Fort Clark, Kinney County, Texas, May 7, 1898, by Edgar A. Mearns. Original number, 11800.

Characters.—Larger than *Passerina ciris ciris;* adult male with under parts considerably paler vermilion red; rump and upper tail-coverts paler, more purplish red. Female paler throughout, with upper parts paler, grayer, less yellowish green, and under parts buffy instead of decidedly yellow.

Measurements of type (taken from the fresh specimen by the author).—Length, 155 mm.; alar expanse, 240; wing, 75; tail, 61; culmen (chord), 11.2; tarsus, 18.3; middle toe with claw, 18.3.

Geographical range.—Breeds in the interior of Texas, migrating to Arizona, Mazatlan, and the plains of Colima.

Remarks.—Topotypes of *Passerina ciris ciris* from Vera Cruz, eastern Mexico, are indistinguishable from specimens from the southeastern United States, and are probably migrants from the latter region. The breeding range of typical *ciris* extends westward from the South Atlantic States around the Gulf coast to Mexico.

A table of comparative measurements appears on following page.

TABLE OF COMPARATIVE MEASUREMENTS.

Nat. Mus. Number.	Original Number.	Locality.	Sex and age.	Date.	Wing.	Tail.	Culmen from base.	Tarsus.	Collector.
		Passerina ciris pallidior.							
221697	83	Fort Clark, Kinney County, Texas	♂ad.	May 5, 1898	72	57	11.2	19.5	Louis di Z. Mearns
153465	708	Albany, Texas	♂ad.	April 29, 1889	74	59	11	19.5	E. M. Hasbrouck
134563	9194	Fort Clark, Kinney County, Texas	♂ad.	May 15, 1893	72	61	11	19	E. A. Mearns
163670	11798	do	♂ad.	April 28, 1898	73	61	11.4	19.7	do
163671	11799	do	♂ad.	May 5, 1898	73	60	11.7	19.5	do
163673	11800	do	♂ad.	May 7, 1898	75	61	11.2	19.5	do
163675	11805	do	♂ad.	do	72	58	11.2	19.2	do
163672	11806	do	♂ad.	do	72	59	11	20	do
163674	11807	do	♂ad.	do	73	60	11.1	19	do
163677	11819	do	♂ad.	do	74	62	11.2	19.6	do
		Passerina ciris ciris.							
221944	——	Christchurch Parish, Charleston Co., S.C.	♂ad.	May 11, 1911	69	54	10.6	18.6	E. J. Brown
222152	19126	do	♂ad.	April 28, 1911	67	54	10.8	18.7	E. A. Mearns
222154	19206	do	♂ad.	May 10, 1911	69	56	10.2	18.8	do
222357	1883	do	♂ad.	May 6, 1911	68	57	9	17	J. H. Riley
222358	1884	do	♂ad.	May 8, 1911	69	56	10	18	do
188275	——	Charleston, South Carolina	♂ad.	June 8, 1902	67	56	10.2	18	William Palmer
222153	19151	Christchurch Parish, Charleston Co., S.C.	♂ad.	May 2, 1811	67	57	10	18.5	E. A. Mearns
2411	——	Savannah, Georgia	♂ad.	—— 1845	68	55	10	18	S. F. Baird
83770	——	St. Mary's, Georgia	♂ad.	April 28, 1877	68	52	10.8	18	William Brewster
133089	156	Matanzas Inlet, Florida	♂ad.	—— ——	69	57	10.9	18	Wirt Robinson

Passerina ciris pallidior.—Average of ten breeding males from western Texas: wing, 73; tail, 59.8; culmen from base, 11.2; tarsus, 19.5.

Passerina ciris ciris.—Average of ten breeding males from South Carolina, Georgia, and Florida: wing, 68.1; tail, 55.4; culmen from base, 10.25; tarsus, 18.16.

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PROCEEDINGS

OF THE

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A NEW RACE OF CHAMELEONS FROM BRITISH EAST AFRICA.

BY THOMAS BARBOUR.

The receipt of Werner's recent revision of the Chameleons, which has just appeared in Das Tierreich, edited by F. E. Schultze (Lieferung 27, Chamaeleontidae, pages 1–52, August, 1911), was the incentive for a re-examination of the material in the Museum of Comparative Zoology. In a collection made last year by Messrs. Childs Frick and W. R. Zappey, and kindly presented to the Museum by Mr. Frick, there is a single female which can not be reconciled with any of the published descriptions. It may be known as

Chamaeleo tenuis excubitor subsp. nov.

This species agrees in many respects with the characters given by Werner (Zool. Jahrb. syst. 15, 1902, pp. 322 and 385 and l. c. 1911, pp. 7 and 38), for *C. tenuis* Matschie. Thus it lacks both gular and ventral crests, has no trace of occipital lobes, has a tail greater in length than that of the body, and lacks knob-like tubercles along the vertebral line.

Werner records the typical *C. tenuis tenuis* Matschi from Usambara and Ukami in German East Africa. He remarks that it is a rare species, reaching a maximum size of 168 mm. for the male, and 138 mm. for the female. The type of this new race is a female which is similar to the female of the typical form in lacking the white line along the belly, but distinguished by its larger size and by the different arrangement of its cranial crests, as the following description shows:

Description.—Casque slightly raised posteriorly with a very indistinct parietal crest; lateral crests, well developed with strong conical tubercles; these lateral crests, instead of extending backwards from the orbit at first in a horizontal direction and then rising directly upward (Werner, 1902, p. 385, pl. 15, middle figure), make a gentle upward curve from the posterior border of the orbit to where they meet at the posterior apex of the well rounded casque.

Upper head scales, flat, polygonal, very irregular in size, eight rows between the superciliary borders (six are mentioned by Werner, 1911, p. 38, for *C. tenuis tenuis*). Body scales distributed in irregular horizontal series, each two or three tubercles wide, and separated from one another by minute scales; these lateral tubercles are homogeneous in size, flat but of somewhat irregular outline. No occipital lobes.

Only a few slightly enlarged tubercles along the mid-dorsal line; otherwise no dorsal crest. Neither gular nor ventral crest.

Limbs long and slender. Tail much longer than head and body, strongly compressed. A single enlarged tubercle in the middle of the posterior border of the casque, where the lateral crests meet.

Type No. 7828, Reptile Collection, Museum of Comparative Zoology, adult female from the Mweru District, north of Mt. Kenia, British East Africa, W. R. Zappey, collector.

It is unfortunately necessary to describe this new form from the female alone. The male of the German East African species bears an elaborate rostral appendage, described by Werner. This, of course, is absent in the female, though it is to be presumed that the male of this new race is provided with a somewhat similar outgrowth.

The total length of the type is 176 mm., 8 mm. longer than the largest male of *C. tenuis tenuis*, and 38 mm. longer than the largest female. This character, together with the other more important ones seen in casque form and squamation would seem to indicate a strongly marked geographical race as occurring sparingly in the region north of Mt. Kenia.

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PROCEEDINGS

OF THE

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THREE NEW SHREWS OF THE GENUS *CRYPTOTIS*.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

Among the Mexican and Central American shrews in the United States National Museum are three specimens of *Cryptotis* which differ so widely from members of the described species that each must be regarded as the representative of a new form.

Cryptotis gracilis sp. nov.

Type.—Adult (skin and skull) No. $\frac{122336}{38171}$, U. S. National Museum. Collected at head of Lari River, near base of Pico Blanco, Talamanca, Costa Rica, by Wm. M. Gabb. Altitude about 6,000 feet.

Diagnosis.—Size and general appearance as in the *Cryptotis mexicana* group (including the Costa Rican *C. orophila*); skull narrow and elongated, this peculiarity more pronounced than in the small *C. tropicalis* and *C. soricina*.

Color.—Entire animal a dark smoke-gray, the upperparts heavily washed with blackish brown, the general effect darker and less plumbeous than in a skin of *C. orophila* taken in February; under-color slate-gray.

Skull.—The skull about equals that of *Cryptotis mexicana* or *C. orophila* in length, but the width throughout is noticeably less, this peculiarity equally appreciable in braincase, interorbital region, rostrum, and palate. Braincase nearly circular in outline when viewed from above, the lateral angles barely indicated; viewed from behind, it is conspicuously narrower in proportion to its depth than in *C. mexicana* and *C. orophila* and appreciably more so than in *C. soricina* and *C. tropicalis*. While the braincase retains essentially the same depth as in the other species of similar size, the rostrum is lower, so that the general outline of skull in lateral view is more strongly cuneate. Antorbital foramen smaller than in *C. mexicana* or *C. orophila*, but in same position, its posterior border over space between m^1 and m^2. Mandible decidedly more slender than in *mexicana* and *orophila*, but not peculiar in form.

Teeth.—Upper incisors and unicuspids similar in general to those of

C. mexicana, the unicuspids showing no tendency toward the conspicuously concave posterior border characteristic of these teeth in *C. orophila;* inner tubercle of unicuspids faintly developed, much as in *C. mexicana peregrina*. Upper cheek-teeth sharing in the general reduction of width characteristic of entire skull, this tendency especially noticeable in the large premolar, the posterior border of which is decidedly shorter than outer border, while in *C. mexicana* and *C. orophila* they are about equal; emargination of posterior borders slight, essentially as in *mexicana* and *orophila;* hypocnes somewhat better developed than usual; m^3 with well developed metacone and third commissure. Mandibular teeth less robust than in *C. mexicana* and *C. orophila* but with no special peculiarities of form.

Measurements.—Head and body,* 70; tail,* 35; hind foot, 13.6 (12.4); condylobasal length of skull, 18.6 (19.4)†; lachrymal breadth, 4.2 (5.0); zygomatic breadth, 5.2 (6.0); distance between zygomatic root and gnathion, 8.2 (8.2); breadth of braincase, 9.0 (10.0); depth of braincase, 5.4 (5.4); mandible, 10.4 (11.0); maxillary toothrow (entire), 8.8 (9.0), mandible toothrow (entire), 7.8 (8.2).

Remarks.—Three very distinct species of *Cryptotis* are now known to occur in Costa Rica: the medium sized *C. orophila* on the Volcano of Irazu, *C. gracilis* in Talamanca, and the small *C. nigrescens* at San José. The last is further distinguished from the two others by the reduced condition of the posterior molar both above and below; m^3 with mesostyle, metacone, and their commissures very small and barely differentiated, m_3 with posterior V reduced to a loop scarcely more than one-fourth as large as anterior V.

Cryptotis frontalis sp. nov.

Type.—Adult female (in alcohol) No. 123,429, U. S. National Museum. Collected near the City of Tehauntepec, Mexico, by F. Sumichrast.

Diagnosis.—Size and general appearance as in *C. mexicana mexicana*. Skull with more robust rostrum and with braincase unusually deepened posteriorly, and rising anteriorly at a much more conspicuous angle (in this respect noticeably surpassing *C. nelsoni*); teeth larger than in true *mexicana* but inner tubercles of upper unicuspids less developed, though retaining distinctly pigmented tips.

Measurements.—Head and body, 66; tail, 27; hind foot, 12.2 (11.0). Skull: condylobasal length, 19.0 (18.6)‡; zygomatic breadth, 6.2 (6.0); lachrymal breadth, 5.0 (5.0); breadth of braincase, 10.2 (10.0); depth of braincase, 6.2 (5.6); mandible, 10.6 (10.0); maxillary toothrow, 8.6 (8.6); mandibular toothrow, 8.0 (8.0).

*Approximate; from skin.

† Measurements in parenthesis are those of an adult female topotype of *C. orophila* (No. 116,649).

‡ Measurements in parenthesis are those of an adult female topotype of *C. mexicana mexicana*.

Cryptotis pergracilis macer subsp. nov.

Type.—Adult female (in alcohol) No. $\frac{155565}{38494}$, near Guanajuato City, Mexico, by A. Dugès.

Characters.—Similar to *Cryptotis pergracilis pergracilis* Elliot, but with third upper unicuspid relatively larger, its area when viewed from the side distinctly more than half that of first unicuspid.

Measurements.—Head and body, 50; tail, 17.4; hind foot, 10 (9.2). Skull: condylobasal length,—(16.0)*; from gnathion to posterior border of parietal in median line, 14.0 (13.8); zygomatic breadth, 5.0 (5.0); lachrymal breadth, 3.6 (3.6); mandible, 8.4 (8.4); maxillary toothrow, 7.2 (7.0); mandibular toothrow, 6.6 (6.4).

Remarks.—In three specimens of *Cryptotis pergracilis pergracilis* from Ocotlan, Jalisco, the type locality, the third upper unicuspid is uniformly less than half as large as first when viewed from outer side.

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* Adult female, Topotype of *pergracilis*.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

GENERAL NOTES.

THE NOMENCLATURE OF THE CHEETAHS.

Two forms of cheetahs are commonly recognized, *Cynailurus jubatus* of India and *C. guttatus* of Africa. A review of the nomenclature of the genus results in an unavoidable and entire change of names. The generic name *Acinonyx* Brookes, Catalogue of the Anatomical and Zoological Museum of Joshua Brookes, Esq., p. 16, 1828, proves, on examination of this work, to be a valid name, and it has priority over *Cynailurus* Wagler, 1830. The first name to be applied to a cheetah was *Felis jubata* Schreber, pl. cv, Die Säugthiere, 1776. From the text of this plate, published in 1777, the type-locality may be settled definitely as the Cape of Good Hope. Schreber says: "Das Vaterland dieses Thieres ist das südliche Afrika; man bekömmt die Felle vom Vorgebirge der guten Hofnung" (vol. III, pp. 392–393). This is followed by a statement that Pennant says it is also found in India, and an account of its use for hunting. The name *jubata* must, therefore, be transferred to the African cheetah. The earliest name for the Indian form is *Felis venatica* Hamilton Smith, 1827. At the time this name was proposed, *jubata* was restricted to Africa.

Of the remaining names which have, at various times, been used for cheetahs, four apply to African animals, one to the Indian species, and three may be disregarded as not originally applying to cheetahs or as indeterminable. *Felis guttata* Hermann, Obs. Zool., p. 38, 1804, is based primarily on "Prosp. Alpini Aegypt. tab. xv, fig. 1, p. 238" (really fig. 2). The editor of Hermann's work, Frid. Lud. Hammer, has supplied a description in brackets. Alpinus' plate proves to be a drawing of a spotted cat, which the text explains was one of a litter of five seen in Cairo in the possession of a Greek courtesan. These kittens were said to have recently been born of a panther and were purchased of Arabs. The description and account which follows is very confusing and it is probably impossible to identify the animal. The name can not, at any rate, be applied to a cheetah. In Griffith's Cuvier, V, p. 175, I find the statement that "*F. guttata*, of Hermann, figured by Schreber, is stated by M. F. Cuvier to be a young panther." *Felis chalybeata* Hermann, Obs. Zool., p. 36, is likewise not determinable, and can be ignored as a cheetah name. It probably really refers to an American spotted cat, though the name later applied to such an animal by various authors is said not to be the

chalybeata of Hermann. I am not able to satisfy myself that *F. megabalia* Hartmann, Zeitschr. ges. Erdkund Berlin, 1868, III, no. 13, p. 55, applies to a cheetah. The animal is said to live in central Africa and to resemble the *F. jubata* of Schreber's plate.

From an examination of the specimens in the National Museum it seems probable that *Acinonyx soemmeringii* (Fitzinger) will have to be recognized as a distinct form, but the material is at present too scanty for conclusive results. The two currently recognized forms will stand as follows:

Acinonyx jubatus (Schreber).
AFRICAN CHEETAH.

1776. *Felis jubata* Schreber, Die Säugthiere, pl. cv. (Cape of Good Hope).
1855. *Cynailurus soemmeringii* Fitzinger, Sitz.-Ber. Math. nat. cl. d. K. akad. Wiss., xvi, hft. 2, p. 245. (Bajuda Steppe, Kordofan.)
1868. *Felis jubata* var. *africana* Hartmann, Zeitschr. ges. Erdkund Berlin, III, no. 13, p. 56. (New name for the combined *C. guttatus* and *C. soemmeringii* of Fitzinger.)
1869. *Felis fearonis* Fitzinger, Sitz.-Ber. Kais. Akad. Wiss., lix, I abth., p. 664. (Cape of Good Hope, l. c., p. 667.)
1877. *Felis lanea* Sclater, Proc. Zool. Soc. London, p. 532. (Beaufort West, Cape Colony.)

Acinonyx venaticus (Smith).
INDIAN CHEETAH.

1827. *Felis venatica* Smith, Griffith's Cuvier, V, p. 166. (India.)
1828. *Acinonyx venator* Brookes, Cat. Anat. & Zool. Mus. of Joshua Brookes, p. 16. (India.)

—*N. Hollister.*

ON THE CORRECT NAME FOR THE RED-WINGED BLACKBIRD OF THE NORTHEASTERN UNITED STATES.

Examination of the series of breeding Red-winged Blackbirds recently collected by Messrs. E. J. Brown, J. H. Riley, and E. A. Mearns, in Charleston County, South Carolina, develops the fact that the form resident on the coastal plain of South Carolina is identical with the Florida bird at present known as *Agelaius phœniceus floridanus* Maynard, with which it exactly agrees in size and coloration; and resident South Carolina birds also have the longer and more slender bill of the Florida form.

Linnæus based his [*Oriolus*] *phœniceus* on Catesby's *Sturnus niger, alis superne rubentis* (Nat. Hist. Carolina, I, p. 13, pl. 13). Catesby's figure of an adult male indicates, by the complete nuptial plumage and slenderness of the bill, that the form portrayed was the resident bird of South Carolina, and not a migrant or winter resident from the north. The text also shows that the author was very familiar with the breeding haunts and nesting habits of the bird, with relation to the ocean tides, making it very probable that the individual figured was taken on the coast.

Agelaius phœniceus floridanus Maynard (1896) therefore becomes a synonym of *Agelaius phœniceus phœniceus* (Linnæus, 1766), and the northern subspecies must be known as

Agelaius phœniceus predatorius (Wilson).

NORTHEASTERN RED-WING.

Sturnus predatorius Wilson, American Ornithology, IV, 1811, p. 30, pl. 30, figs. 1 and 2.

Characters.—Larger than *Agelaius phœniceus phœniceus** with a shorter and stouter bill. Female darker, especially below, where the black stripes are much broader.†

Geographical distribution.—This form breeds from Fort Macon, North Carolina, and Smith's Island, Virginia, north to Nova Scotia, and westward, wintering as far south as Georgia and the Gulf States.‡

Remarks.—Wilson's figures, descriptions and measurements all represent the northern subspecies; and his reference, in synonymy, to specimens in Peale's Museum ("No. 1466, 1467") make it probable that his material came from eastern Pennsylvania, which region I therefore fix as the type locality of his *Sturnus predatorius*.

—*Edgar A. Mearns.*

NOTE ON THE MEXICAN BATS OF THE GENUS *DASYPTERUS*.§

Mr. Geo. F. Gaumer has recently presented to the U. S. National Museum some specimens of *Dasypterus* taken at Izamal and Yaxcash, Yucatan, which represent two very distinct species. One is a large animal with skull about 18 mm. in condylobasal length, while the other is noticeably smaller; condylobasal length of skull about 15 mm. The difference in size between the two animals is thus about the same as that separating the European *Nyctalus noctula* and *N. leisleri*. Apparently this is the first instance on record of the occurrence of two members of the *Dasypterus ega* group at one locality.

The smaller animal, represented by adults only, appears to be the *D. ega panamensis* of Thomas; unquestionably it is a local representative of true *ega*, a species which in its various geographic forms ranges from Argentina to Lower California. It maintains a uniformly small size throughout a very extended area, the range of individual variation in condylobasal length of skull in specimens from Paraguay, Brazil, Bolivia, Yucatan and Lower California being from 14 to 15.6 mm. The larger species, represented by both adults and young from Yucatan, is equally constant, as the range of variation in adult skulls from Yucatan, Chiapas,‖

* See Ridgway's Birds of North and Middle America, vol. II, 1902, pp. 331 and 333.

† The darkest female specimens in the collection of the United States National Museum were collected at Plum Island Marsh, Essex County, Massachusetts, by Mr. William D. Carpenter, in June, 1911.

‡ Numerous winter specimens of both sexes, from South Carolina, in the U. S. National Museum collection, are all *predatorius*.

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‖ Adult male (skin and skull), No. 133,030 (Biological Survey Collection), San Bartolomé, Chiapas, March 15, 1904, Nelson and Goldman.

southern Texas, Louisiana and Florida is only from 17.6 to 18.4 mm. This larger animal is *Dasypterus intermedius* (H. Allen), originally described from Matamoras, Tamaulipas. While it is not possible, in the absence of a better series of skins than that now available, to find any appreciable differences between the Yucatan and Chiapas specimens and true *intermedius*, it is evident that the form occurring in Louisiana and Florida (*D. floridanus* Miller) is sufficiently characterized by its shorter forearm and third finger to be regarded as distinct.

—*Gerrit S. Miller, Jr.*

THE VOLCANO RABBIT OF MOUNT IZTACCIHUATL.*

In the catalog of the objects exhibited by the Mexican "Comisión Geográfico-Exploradora" at the Columbian Exposition in Chicago† Professor Augustin Diaz figures (pl. 42) a rabbit of the genus *Romerolagus*, under the name "Conejo del Volcán (*Lepus diazi* Ferrari-Pérez, sp. nov)." This plate is not mentioned by Merriam in the original description of *Romerolagus nelsoni*‡ from Mt. Popocatepetl, or by Nelson in his monograph of the Rabbits of North America,§ though it is alluded to by an anonymous editorial writer in Natural Science for March, 1897.‖

The validity of the specific name *diazi* is unquestionable under the International Code of Zoological Nomenclature (Art. 25, and Opinion 1). According to the same Code the authority for the name is Diaz, not Ferrari-Pérez, since *Lepus diazi* remained in MS. until the publication of the catalog by Diaz, and no statement is anywhere made that "some other person is responsible for [the publication of] said name and its indication [= illustration]" (Art. 21, and Opinion 4).

Nomenclatorily the case presents no difficulties, but zoologically it has hitherto been obscured by the uncertainty as to whether the "Volcano Rabbit" was identical with *Romerolagus nelsoni*. This doubt has now been removed by the kindness of Professor Ferrari-Pérez, through which I have been enabled to examine the type and a second specimen of *Romerolagus diazi*. Both were taken in Puebla, on the eastern slope of Mt. Iztaccihuatl, a region about fifteen miles from the type-locality of *Romerolagus nelsoni*.

As compared with four skins of *Romerolagus nelsoni* the two specimens of *R. diazi* (both marked female, the type taken in March, 1885) show slightly less black in the grizzle of dorsal surface and slightly more gray on cheeks, characters probably due to the fading usual in mounted spec-

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† Exposición Internacional Columbina de Chicago en 1893 | Comisión Geográfico-Exploradora | de la | República Mexicana | Catálogo | de los objectos que componen el contingente de la Comisión, precidido de algunas notas | sobre su organización y trabajos | por el ingeniero director | Agustín Díaz | Coronel de Estado Mayor Especial, Ex-Profesor en el Colegio Militar y en la | Escuela Especial de Ingenieros | Xalapa-Enríquez. Marzo de 1893 | Tipografía de la Comisión Geográfico-Exploradora. |

‡ Proc. Biol. Soc. Washington, X, pp. 169–174. December 29, 1896.

§ North American Fauna No. 29. August 31, 1909.

‖ X, p. 151.

imens. The skull of the type (that of the other specimen is missing) lacks the mandible and the entire basal part of braincase, though the remaining portion is in fair condition. It has certain peculiarities not shared by any of the five skulls of *R. nelsoni:* the postorbital processes are broader and heavier, the palate is more arched between toothrows, and the dorsal profile of braincase is less bent downward posteriorly. These cranial characters are, however, quite within the range of normal variation in members of the family. I consequently have no hesitation in regarding the later name *nelsoni* as a synonym of *diazi.* Mr. E. W. Nelson, who examined the specimens with me, is of the same opinion.*

Measurements of the type specimens (those of R. "*nelsoni*" in parenthesis): hind foot, 48.6 (53); ear from crown, 38.6 (37); greatest length of skull, 60.4 (60.6); zygomatic breadth, 29+ (30.4); breadth of braincase, 22.6 (23.4); postorbital constriction, 10.0 (9.8); interorbital constriction 9.8 (10.0); nasal, 24.4+ (24.8); greatest breadth of both nasals together, 9.8 (10.0); diastema, 16.0 (15.8); length of palate (lateral), 7.4 (7.8); width of palate between anterior premolars, 8.0 (7.6); width of palate between posterior molars, 10.4 (10.6); depth at middle of palate, 13.6 (14.0); maxillary toothrow (alveoli), 11.6 (12.0).

Note.—Four specimens (Nos. 174531–4) collected at Textlananquila on Mount Iztaccihuatl, above Amecameca, and presented to the U. S. National Museum by Professor Ferrari-Pérez, arrived in Washington after this article was in type. They entirely confirm the identity of *Romerolagus diazi* and *R.* "*nelsoni*".

—*Gerrit S. Miller, Jr.*

* In view of Mr. Nelson's personal acquaintance with the region where the two types were collected I requested him to give me a brief account of the geography. This he has kindly done as follows: "The total area occupied by *Romerolagus* appears to be limited to the middle slopes of the volcanos Popocatepetl and Iztaccihuatl. The boundary line between the states of Mexico and Puebla runs along the crests of these mountains in a northerly and southerly course, thus placing the western slopes in Mexico and the eastern ones in Puebla. These mountains are joined by a broad ridge about 12,000 feet high, at each end of which rise the high peaks. The middle slopes, where *Romerolagus* lives, are continuous around both mountains and lie in an area 20 miles long, in a north and south direction, and ten miles broad, from east to west. *Romerolagus* lives permanently only where it has the shelter of the coarse saccaton grass and the areas occupied by this plant are broken by hot slopes on which it can not maintain itself. These breaks are not wide and can be readily crossed by small mammals. The extremely limited area which *Romerolagus* occupies, and the absolute identity of climatic and other physical conditions within it, appear to preclude the possibility of the existence of more than one local form."

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW ROE-DEER FROM CHINA.

BY GERRIT S. MILLER, JR.

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While exploring portions of western China during the summer of 1909, Mr. Arthur de C. Sowerby procured skins and skulls of *Capreolus* in the provinces of Shensi and Kansu.* Those from Shensi are essentially topotypes of *C. bedfordi* Thomas; the single Kansu specimen represents a species readily distinguishable from the members of the genus hitherto described.

Capreolus melanotis sp. nov.

Type.—Immature female (permanent premolars in place, but crown of m^3 not yet in line with cutting surface of other teeth) No. 155,220 U. S. National Museum. Collected thirty miles east of Ching-yang-fu, Kansu, China, August 14, 1909, by Arthur de C. Sowerby. Original number, 247.

Diagnosis.—Resembling *Capreolus bedfordi* in essential characters, including the hypsodont form of the teeth, but color of summer pelage more reddish, and outer surface of ear mostly clear black in striking contrast with surrounding parts.

Color.—Upperparts a clear tawny, brighter and richer than that of Ridgway, becoming duller on sides and fading on underparts to ochraceous-buff or cream-buff. On sides of body the change is gradual, but on sides of neck it is so abrupt as almost to produce a contrasted dorsal band. Lower half of underside of neck variegated by faint grayish white blotches about the size of finger-prints. Markings on muzzle and chin normal, apparently rather better defined than in *C. bedfordi*. Inner surface of ear light cream-buff; outer surface black, except at extreme base, which is like sides of crown, and along outer border where there is a wash of cream-buff extending upward as a band about 15 mm. wide to within 20 mm. of tip.

*Descriptions of four new mammals obtained during the same expedition have already been published (Proc. Biol. Soc. Washington, XXIV, pp. 53–56. February 24, 1911).

Skull and teeth.—Both skull and teeth appear to be more robust than in *C. bedfordi*, but the material is insufficient to show whether this character is constant. As compared with a male *C. bedfordi* of same age and a female slightly younger, the type of *C. melanotis* shows the following peculiarities: lachrymal vacuities decidedly larger; lachrymal pit barely indicated; mesopterygoid fossa extending forward as an acute angle to level of lateral palatine emarginations.

Measurements.—Type: head and body, 1110; hind foot, 350 (310); ear from crown, 140; condylobasal length of skull, 186 (186);* zygomatic breadth, 86.4 (80); least orbital breadth, 53.6 (51.4); breadth of braincase, 61.4 (57.6); depth of braincase at middle, 57.4 (53); nasal, 59.6 (61.6); greatest breadth of both nasals together, 19.8 (19); mandible, 156 (152); maxillary toothrow, 69 (67); mandibular toothrow, 77± (73.6); crown of m^1, 14.6 x 13.8 (14.0 x 12.8); crown of m^2, 15.6 x 14.0 (14.6 x 13.2); crown of m_2, 15.2 x 10.0 (14.0 x 9.0).

Remarks.—Together with *Capreolus bedfordi* this animal differs from *C. capreolus* in the conspicuously hypsodont character of the teeth. Though this is shown by both molars and premolars it is most noticeable in the latter. Height of inner border of crown of middle upper premolar in type, 12.8 mm., diameter of crown in line of toothrow, 9.2. The same measurements in a male *C. bedfordi*, 12.4 and 10. In a female *C. capreolus* from Bavaria they are 7.2 and 8.8, and in a male from Italy, 7.4 and 8.2.

* Measurements in parenthesis are those of a male *C. bedfordi* of approximately the same age.

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PROCEEDINGS

OF THE

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DESCRIPTIONS OF THREE NEW BIRDS FROM CANADA.

BY J. H. RILEY.

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While working up the collection of birds taken on the 1911 Alpine Club of Canada's expedition to Jasper Park, Yellowhead Pass, and the Mount Robson region, the following birds have been found to be apparently unnamed and are herewith described.

Lagopus lagopus ungavus subsp. nov.

Type, U. S. National Museum, No. 101,068, adult male, Ft. Chimo, Ungava, July 22, 1884. Collected by L. M. Turner (original No. 5823).

Like *Lagopus lagopus albus*, but with a heavier bill. Measurement of type: Wing, 205; tail, 128; culmen, 21.5; depth of bill at base, 15.

Remarks.—Leaving out of consideration *Lagopus lagopus alexandræ*, which is recognized as a perfectly distinct form, I have gone over the same ground as Mr. A. H. Clark,* with some additional material, and reached the following conclusions: That the name *Lagopus lagopus lagopus* should be restricted to the small-billed European bird and that the bird from the west side of Hudson Bay should be known as *Lagopus lagopus albus*.† Specimens from the mountains of western Alberta and eastern British Columbia are slightly smaller than birds from Hudson Bay and northern Alaska. There appear to be no color differences except in *Lagopus lagopus alexandræ*, which is darker. In my opinion, the willow ptarmigans of the North American mainland can be separated into at least three recognizable races, as follows:

1. *Lagopus lagopus alexandræ* Grinnell, from the southwest coast of Alaska.

2. *Lagopus lagopus albus* Gmelin, from the west side of Hudson Bay, west through northern Alaska to eastern Siberia.

3. *Lagopus lagopus ungavus* subsp. nov., from Ungava and probably the eastern shore of Hudson Bay south.

* Proc. U. S. Nat. Mus., 38, No. 1727, April 30, 1910, 51.

† [*Tetrao*] *albus* Gmelin, Sys. Nat., I, pt. 2, 750.

The average measurements of a series of willow ptarmigans taken in the breeding season, except *Lagopus lagopus alexandræ*, from the various parts of its range are as follows:

	Wing	Tail	Culmen	Depth of Bill
One male, Norway	177	97.5	17	11
Ten males, Ungava	197	121.9	20.9	13.5
Five males, west side Hudson Bay	200.6	126.7	19.1	11.8
Eight males, mountains Alberta and B. C.	188.9	118.8	18.5	12.2
Six males, northern Alaska	196.8	119.9	18.9	12.8
One male, Lake Iliamna, Alaska	195.5	111	18.5	12
One male, Petropaulski, Kamchatka	204	125.5	20	
Ten females, Ungava	179	110	19.3	12.9
Three females, west side Hudson Bay	191.2	116.7	18.3	10.8
Seven females, mts. Alberta and B. C.	174.6	96.8	16.5	11.1

Melospiza melodia inexspectata subsp. nov.

Type, U. S. National Museum, No. 222,829, adult female, three miles east of Moose Lake, British Columbia, August 21, 1911. Collected by J. H. Riley (original number 2268).

Similar to *Melospiza melodia rufina*, but the browns of the upper parts lacking the reddish tinge, thus giving to the back a gray cast; below not so heavily streaked; averaging smaller. Measurement of type: Wing, 65; tail, 63.5; culmen, 12; tarsus, 22; middle toe, 15.5.

Remarks.—This race is founded on four specimens, as follows: the type and a young male still in the juvenile plumage from the type locality; one adult female from Henry House, Alberta, September 14, 1911; and an adult female from near Telegraph Creek (25 miles east, near Buckley Lake), British Columbia, July 26, 1910, the latter specimen taken by E. A. Preble and in the Biological Survey Collection. Average of the three adult females: Wing, 63.8; tail, 60.3; culmen, 12; tarsus, 21.3; middle toe, 15.7. Average of three adult females of *Melospiza melodia rufina* from the Sitkan District taken at about the same season of the year: Wing, 67; tail, 63.8; culmen, 12.8; tarsus, 22.8; middle toe, 16.

One of the interesting results of our trip was the discovery of this song sparrow, which instead of resembling *Melospiza melodia merrilli*, as one would naturally suppose, is more nearly related to the Pacific Coast bird. Its range is probably the interior mountain valleys from northern British Columbia at least, south to Henry House, Alberta, and in migration probably further. The bird taken at Henry House may have been a migrant, but the type was probably a breeding bird as the young male taken at the same locality seems to indicate.

Passerella iliaca altivagans subsp. nov.

Type, U. S. National Museum, No. 222,832, nearly adult male, Moose Branch of the Smoky River, Alberta (about 7000 feet altitude), July 31, 1911. Collected by J. H. Riley (original number, 2175).

Similar to *Passerella iliaca schistacea*, but middle of the back mars brown instead of mouse gray; wings and tail with more red in the brown (near burnt umber). Measurement of type: Wing, 81.5; tail, 76; culmen, 11.5; tarsus, 21; middle toe, 14.5.

Remarks.—This race is founded on two slightly immature birds from the type locality; an immature male from Moose Pass, British Columbia; and an immature specimen from Thudade Lake (source of Finlay River), British Columbia. An adult male from Columbia Falls, Montana, September 24, 1896; an adult male and female, Ft. Klamath, Oregon, April 9 and 28, 1883; and an adult female, Ft. Crook, California, April 12, 1860, all in the collection of the U. S. National Museum, are apparently migrants of this form. They differ from the type in having the upper parts more rusty, but from typical *Passerella iliaca schistacea*, to which they have been referred, they are quite distinct, having the mouse gray of the upper parts of that race replaced by broccoli brown and burnt umber and the spotting of the under parts prout's brown, not sepia. Apparently there is no difference in size.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THREE NEW MAMMALS FROM CENTRAL AND SOUTH AMERICA.

BY E. A. GOLDMAN.

While engaged in the identification of a collection of mammals for the Biological Survey the following unnamed species have been detected among the undetermined material in the U. S. National Museum. For the privilege of describing them, and for other courtesies, I am indebted to Mr. Gerrit S. Miller, Jr., Curator, and Mr. N. Hollister, Assistant Curator of the Division of Mammals.

Marmosa ruatanica sp. nov.

Type from Ruatan Island, off the north coast of Honduras. No. 7785, adult, U. S. National Museum, collected by J. Akhurst.

General characters.—Size large—about as in *chapmani*, of Trinidad; general color similar, but duller; black orbital markings extending forward to nose; molariform teeth smaller.

Color.—Type (in worn pelage): General color above between cinnamon and isabella color, becoming smoky-brown on top of head, and lighter again on broad line down middle of face; blackish orbital markings extending to nose; under parts cream color, tinged with pale yellow; ears dark brownish; feet soiled white; tail dusky on basal half, becoming somewhat lighter terminally.

Skull.—Similar in general to that of *chapmani*, the rostrum rather broad and heavy as in that species; supraorbital ridges less developed; nasals similar in shape, but less prolonged posteriorly; molariform teeth smaller.

Measurements.—Dry skin: Total length, 338; tail, 188; hind foot, 24.5. *Skull:* Occipito-nasal length, 40.5; zygomatic breadth, 22.7; nasals, 17.7 x 4.9; interorbital breadth, 5.8; palatal length, 21; three anterior molariform teeth, 6.

Remarks.—In general characters this insular species agrees more closely with *chapmani* of Trinidad, than with any mainland form available for

direct comparison. It is well marked externally by the greater extension of the black orbital areas. The type, and only known specimen is in a much worn pelage, and would doubtless be brighter colored in the fresh coat.

Marmosa zeledoni* sp. nov.

Type from Navarro, Costa Rica. No. $\frac{12}{37}\frac{8}{1}\frac{5}{3}\frac{5}{3}$, ♂ adult, U. S. National Museum, collected by Juan Cooper, for José C. Zeledon, March 1, 1878.

General characters.—Allied to *mexicana*, but color darker, more rufescent, the line of demarcation between whitish under parts and buffy sides very sharp; interparietal narrower. Somewhat similar to *mitis*, but color decidedly darker, and skull quite different.

Color.—Upper parts cinnamon-rufous, becoming lighter on middle of face, and paling to ochraceous buff on cheeks, sides of neck, and flanks, the latter color encroaching on under parts along sides of belly where the fur is basally plumbeous; throat, chest, median line of belly, inguinal region, and inner sides of limbs yellowish white, the hairs whitish to roots; ears brown; orbital area black; fore feet brownish; hind feet soiled white; tail light brownish.

Skull.—Similar to that of *mexicana*, but interparietal narrower, less extended laterally along lambdoid crest. Somewhat like that of *mitis*, but braincase larger; interorbital region broader; supraorbital and temporal ridges more widely separated.

Measurements.—Type (dry skin): Total length, 345; tail, 168; hind foot, 23. *Skull* (type): Greatest length, 36; zygomatic breadth, 19.2; nasals, 16.2 x 4.4; interorbital breadth, 6.5; palatal length, 18.2; three anterior molariform teeth, 5.2.

Remarks.—This form is probably most closely allied to *mexicana*, but is readily distinguished by richer color. The supraorbital and temporal ridges in *mexicana* and *zeledoni* are widely separated, and especially in the latter, extend backward across the parietals in nearly parallel lines.

Specimens examined.—Five, from localities as follows: Costa Rica, Navarro (type locality), 2; Nicaragua, Escondido River, 3.

Proechimys steerei† sp. nov.

Type from Rio Purus, a southern tributary of the Amazon, in northwestern Brazil. No. 105,535, ♂ adult, U. S. National Museum, collected by J. B. Steere, in 1901.

General characters.—Size medium; color dark and rich; ankles dusky all around; tail rather short, thinly haired; skull without temporal ridges. Closely resembling *semispinosus* in color, and in arrangement and stiffness of dorsal spines, but skull more like that of *trinitatis*.

Color.—Upper parts between orange rufous and ferruginous, lined with black, the color richest and darkest along median line of back, fading to buffy grayish or brownish on cheeks, flanks, and outer sides of limbs; under parts and inner sides of limbs pure white, abruptly interrupted at

* Named for Mr. José C. Zeledon, the well-known Costa Rican naturalist.

† Named for Dr. J. B. Steere, the naturalist and traveler.

ankles by a dusky band below which the white is continued along inner side of metatarsus to toes; fore feet and outer side of metatarsus pale brownish; nose and ears blackish, the latter nearly naked as usual in the group; tail brownish above, grayish below.

Skull.—Similar in general form to that of *trinitatis*, but rostrum broader above, less compressed over roots of incisors; supraorbital ridges heavier; audital bullae decidedly larger, more inflated; temporal ridges absent as in *trinitatis;* dentition about the same, except that there are four transverse furrows or enamel islands in the lower premolars of five skulls examined, instead of three as in the three skulls of *trinitatis* available for comparison.

Measurements.—Type (dry skin): Total length, 347; tail vertebrae, 122; hind foot, 49. *Skull:* Greatest length, 53.8; condylobasal length, 48; zygomatic breadth, 26; length of nasals, 19.3; interorbital breadth, 11.9; length of palatal bridge, 10.5; alveolar length of upper molariform toothrow, 8.5.

Remarks.—This spiny rat is a member of the same group as *trinitatis* and *mincae*, but differs in important respects from both and I am unable to associate it very closely with any of the other species described. In dentition it agrees with *trinitatis*, the type species of the genus, in the possession of three transverse furrows, or elongated enamel islands in most of the molariform teeth. This character is somewhat variable, however, in *trinitatis* and other species, the number in the lower molars being sometimes reduced to two. The furrows may also become divided through wear and the normal number thus obscured through the multiplication of enamel islands.

Specimens examined.—Five, all from the type locality.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

TWO NEW SHREWS FROM KASHMIR.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

In a collection of mammals from Kashmir recently presented to the United States National Museum by Dr. W. L. Abbott are specimens of two shrews which have not hitherto been described.

Crocidura pullata sp. nov.

Type.—Adult male (skin and skull) No. 173,213 U. S. National Museum. Collected at Kotihar, Kashmir (altitude 7000 feet) October 9, 1910, by by Dr. W. L. Abbott. Original number, 7421.

Diagnosis.—General characters much as in *Crocidura fumigata* as described by de Filippi and figured by Dobson, but size greater (head and body 80–90 instead of about 60), third upper unicuspid about equal to second, and basal lobes of i^1 low and broad as in *C. russula*.

Color.—Upperparts a uniform, dark hair-brown with a slaty tinge and sometimes a wash of wood-brown, the hairs showing rather noticeable silvery reflections in certain lights; basal portion of hairs slate-color; underparts between smoke-gray and ecru-drab, the slaty under color showing through irregularly.

Skull and teeth.—The skull is about the same length as that of *Crocidura russula*, but the general structure is decidedly more robust, and the outline of braincase is noticeably longer than broad; distance from front of glenoid surface to back of condyle equal to greatest breadth of braincase instead of decidedly less as in *C. russula;* mandible more heavily built, both in ramus and postdental region. The teeth differ from those of *Crocidura russula* in relatively greater size of first unicuspid, less development of minute cusp at inner base of large upper incisor, and greater crown area of molars.

Measurements.—Type: head and body, 90; tail, 43; hind foot (dry) 15 (14). Average and extremes of nine adults from the type locality: head and body, 86.1 (82–90); tail, 42.6 (40–47). Skull of type: condylobasal length, 19.8; zygomatic breadth, 6.2; breadth of braincase, 9.0; condylo-

glenoid length, 9.0; depth of braincase, 4.8; mandible, 10.2; maxillary toothrow(entire) 8.8; mandibular toothrow (entire), 8.2.

Specimens examined.—Sixty-three, from the following localities in Kashmir: Kotihar Valley, 27; Sogam, 2; Nowboog Valley, 33; Wangat Valley, 1.

Sorex planiceps sp. nov.

Type.—Adult male (skin and skull) No. 173,915, United States National Museum. Collected at Dachin, Khistwar, Kashmir (altitude, 9000 feet), May 30, 1911, by Dr. W. L. Abbott. Original number, 7714.

Diagnosis.—Color and general external appearance as in *Sorex minutus*, but size less diminutive; skull as in the largest specimens of *S. minutus*, but rostrum, palate and interorbital region wider, and braincase more flattened (ratio of depth to width about 50); teeth relatively larger than in *S. minutus* though of the same general form, except that basal cusp of anterior upper incisor is lower and more robust, somewhat as in *S. araneus*.

Measurements.—Type: head and body, 69; tail, 44; hind foot, 11; condylobasal length of skull, 16.8; zygomatic breadth, 4.8; lachrymal breadth, 3.2; breadth of braincase, 8.0; depth of braincase at middle, 4.0; mandible, 8.4; maxillary toothrow, 7.0; mandibular toothrow, 6.8.

Specimens examined.—Seven, from the following localities in Kashmir: Dachin, Khistwar, 3; Sind Valley, 1; Gadasar, 1; Sogam, 1; Nowboog Valley, 1.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE AMERICAN SPECIES OF FAGONIA.

BY PAUL C. STANDLEY.

[By permission of the Secretary of the Smithsonian Institution.]

The representatives of the genus Fagonia are confined chiefly to two parts of the earth, the more arid regions bordering the Mediterranean in Europe, Asia, and Africa, and the deserts about the Gulf of California in North America. Two species occur on the western coast of South America in Chile and Peru, while another has only recently been described from the interior of Mexico. The genus is composed of remarkably uniform species that are similar in general appearance and differ only in minor characters such as pubescence, shape of leaflets, and form of stipules. In the Kew Index but two names are recognized as valid. All the Old World species, of which a considerable number have been described, along with *Fagonia chilensis* and *F. californica*, are referred to the type species, *F. cretica* L. After an inspection of the Old World material in the National Herbarium, consisting of many more sheets than there are of American collections, the writer is inclined to believe that there are several species in the Eastern Hemisphere although possibly not so many as in America. Our American forms certainly are more diversified than those of Europe and Africa. The latter, for example, exhibit no such distinct types as *Fagonia californica*, *F. palmeri*, and *F. scoparia*.

The genus is ably treated by Dr. P. A. Rydberg in the part of the North American Flora dealing with the Zygophyllaceae, five species being recognized for North America. Before the publication of that monograph only two species had been described from the region, *F. californica* and *F. palmeri*. Miss A. M. Vail in 1895 named a subspecies of *Fagonia californica* from the Southwest.

Recently the writer had occasion to determine several collections of this group. One of them seemed unlike any of the species described by Dr. Rydberg, and upon examination of other material in the herbarium several forms were found which seem to merit description. It was discovered, besides, that Mr. T. S. Brandegee has described a very remarkable species from Coahuila within the present year. It seems worth while to prepare an account of these newest discoveries and to coordinate them with previously described species by a key. Only two species have been described from South America and since they are closely related to ours and we have herbarium material of both, they may be included as well.

The authors of the Kew Index considered that both *Fagonia californica* and *F. chilensis* were synonymous with *F. cretica* of the Old World. The most casual comparison of our plants with *Fagonia cretica* compels a different conclusion. That species has much larger flowers than any of the American ones, its leaflets are larger, the pubescence different, the beak of the fruit is conspicuously thickened at the base, a condition not existing in the plants of the western world, while *F. cretica* is much stouter than our plants that are nearest related to it. *Fagonia chilensis* is almost like *F. californica* but the differences are such that the two can be distinguished, and because of their different ranges it seems as well to hold them apart.

The writer is under obligations to Dr. Wm. Trelease who courteously loaned him all the American material of the genus in the herbarium of the Missouri Botanical Garden.

KEY TO THE SPECIES.

Leaves wanting; stipules triangular-subulate, not more than 1 mm. long; branches erect; sepals persistent . . . . . 1. *F. scoparia.*

Leaves present; stipules subulate, averaging much more than 1 mm. long; branches spreading; sepals caducous.

Leaflets 5 . . . . . 2. *F. palmeri.*

Leaflets 3.

Ovaries glabrous . . . . . 11. *F. laevis.*

Ovaries and mature fruit pubescent.

Pedicels twice as long as the fruit or more, glabrous or slightly scaberulous . . . . . 12. *F. longipes.*

Pedicels not longer than the fruit, mostly shorter, or when longer glandular.

Leaflets glabrous.

Stems densely glandular . . . . . 3. *F. viscosa.*
Stems not glandular, sparingly scaberulous on the angles or glabrous.
Beak of the fruit 1 to 1.5 mm. long; stems usually scaberulous; North American . . . 9. *F. californica.*
Beak 2 to 3 mm. long; stems glabrous; South American . . . . . 10. *F. chilensis.*
Leaflets pubescent, often glandular.
Plants not glandular; South American . . . . . 7. *F. aspera.*
Plants more or less glandular; North American.
Pedicels shorter than the fruit.
Stipules long and stout; leaflets 8 to 13 mm. long; stems densely glandular . . . 4. *F. pachyacantha.*
Stipules short, slender; leaflets 3 to 10 mm. long; stems sparingly or often scarcely at all glandular. 8. *F. barclayana.*
Pedicels longer than the fruit.
Leaflets linear; stipules 4 to 5 mm. long, spreading; stems sparingly soft-villous . . . . . 5. *F. insularis.*
Leaflets lanceolate or linear-oblong; stipules 2 mm. long, reflexed; stems scantily scaberulous . 6. *F. rosei.*

1. **Fagonia scoparia** Brandegee, Univ. Calif. Publ. Bot. **4** : 181. 1911.

Type locality, "On Cerro del Macho, Coahuila."

Perennial with numerous very slender, broom-like, erect, glabrous, striate, not angled branches; leaves unknown, apparently wanting; stipules 1 mm. long or less, triangular-subulate, spinescent tipped; flowers terminating the branches or on slender pedicels mostly about 15 mm. long; sepals persistent, lanceolate or lance-ovate, acute or somewhat acuminate, 4 mm. long or less; petals rose purple, about 5 mm. long, acute or acuminate; fruit 6 mm. long, hirsutulous, the beak not seen.

Specimens examined: Coahuila: Cerro del Macho, June, 1910, Purpus 4495, type collection.

This is a very remarkable species and comes from a locality far distant from the usual range of the genus in North America. Mr. Brandegee reports that although some of the specimens bear young branches there are no leaves on any of them. The habit of the plant is different from that of our other species, the flowers are smaller, the petals have scarcely any claws, and the sepals are persistent instead of caducous. Doctor Rydberg's diagnosis of the genus in the North American Flora must be changed to include this plant, especially that part dealing with the leaves and the persistence of the sepals. Perhaps when more complete material is secured the plant may prove to be the type of a new genus.

2. **Fagonia palmeri** Vasey & Rose, Contr. Nat. Herb. **1** : 82. 1890.

Type locality, "Santa Rosalia," Lower California.

A stout, rigid, much branched plant, growing in dense clumps 30 to 45 cm. high; stems yellowish, angled and striate, densely glandular, some-

times woody at the base; petioles 4 to 10 mm. long; stipules stout, rigid, spinescent, densely glandular, one-third to one-half as long as the petioles; leaflets five, nearly linear, the principal ones of each leaf 3 to 10 mm. long, spinescent tipped; pedicels 3 to 5 mm. long, equaling or shorter than the fruit; sepals oblong or oblong-lanceolate, acute, 4 or 5 mm. long; petals pinkish, 6 to 8 mm. long; fruit minutely pubescent and glandular, the beak about 3 mm. long.

Specimens examined: Lower California: Santa Rosalia, 1889, Palmer 209, type; San Francisquito Bay, April 9, 1911, Rose 16,729; Tiburon Island, April 11, 1911, Rose 16,779.

The species is one of the most distinct of the entire genus. No other is known to have more than three leaflets. Its range, so far as known, does not extend beyond Tiburon Island in the Gulf of California, and the middle part of the east coast of Lower California.

3. **Fagonia viscosa** Rydb. N. Amer. Fl. **25**[2]: 104. 1910.

Fagonia californica glutinosa Vail, Bull. Torrey Club **22**: 229. 1895. Not *F. glutinosa* Delile, 1813.

Type locality, "Sonora, Mexico." Type collected by C. G. Pringle in 1884.

Stems stout, densely covered with large, yellowish glands, glabrate in age; petioles stout, 4 to 10 mm. long, glabrous; stipules thick, rigid, glabrous or sparingly glandular, much shorter than or even equaling the petioles; leaflets 3, 8 to 15 mm. long, 3 to 8 mm. wide, the terminal one rhombic-obovate to oblanceolate, the lateral ones lanceolate and oblique, spinulose tipped, glabrous, thick and fleshy; pedicels stout, 3 to 5 mm. long, glandular; sepals oblong or oblong-lanceolate, acute; petals purple, 6 to 8 mm. long; peduncles 3 to 5 mm. long, shorter than the fruit; this strigillose and glandular, the beak 1.5 to 2 mm. long.

Specimens examined: California: Southwestern part of the Colorado Desert, San Diego County, April, 1887, Orcutt; Signal Mountain, April 2, 1903, Abrams, 3158.

Lower California: Santa Rosalia, 1889, Palmer 180; Los Angeles Bay, 1887, Palmer 546a; Signal Mountain, May 6, 1894, L. Schoenfeldt 2950.

4. **Fagonia pachyacantha** Rydb. N. Amer. Fl. **25**[2]: 105. 1910.

Type locality, "Lower California." Type in the New York Botanical Garden, collected by Leon Diquet.

An undershrub, 3 to 6 dm. high; branches yellowish or straw-colored, viscid, with glandular hairs, striate and somewhat angled; stipules stout, subulate, 6 to 10 mm. long, spreading or somewhat reflexed, longer than the petioles; petioles 5 to 8 mm. long, spreading; leaflets 3, linear, 8 to 15 mm. long, about 1 mm. wide, thick, glandular; peduncles 3 to 5 mm. long; sepals ovate-lanceolate, 3 mm. long, with very short spinulose tips; petals rose-purple, 6 to 8 mm. long; blades obovate-spatulate; fruit 5 mm. long, reticulate, pubescent, the hairs with thickened bases; beak about 2 mm. long.

The writer has seen no material of this species. The description is a transcript of the original one.

5. **Fagonia insularis** Standley, sp. nov.

Stems slender, much branched, 30 cm. long or less, sparingly soft-villous with short, white hairs; petioles 5 to 12 mm. long, short-villous and slightly viscid; stipules slender, spinescent, 4 to 5 mm. long, short-villous and viscid, spreading; leaflets 3, linear, spinescent tipped, 1 to 9 mm. long, pubescent and glandular; pedicels about 8 mm. long, reflexed in age, bearing numerous short, gland-tipped hairs; sepals 2 mm. long, oblong, acuminate; petals 5 mm. long; fruit finely pubescent and sparingly glandular, 3 to 4 mm. high, with a slender beak 2.5 to 3 mm. long.

Type in the U. S. National Herbarium, No. 14,216, collected on Carmen Island, Lower California, in November, 1890, by Dr. Edward Palmer (No. 830). Also collected on the same island by Doctor Palmer 20 years earlier (1870), No. 13.

Of the previously described species this appears to be nearest *Fagonia pachyacantha*, but is a more slender plant with smaller leaflets, slender, shorter stipules, and has a longer beak on the smaller fruit.

6. **Fagonia rosei** Standley, sp. nov.

Perennial with slender, scaberulous and somewhat glandular stems about 30 cm. long; petioles 4 to 7 mm. long, glandular; stipules stout but short, 1.5 to 3 mm. long, mostly 2 mm., spinescent, prominently reflexed, glandular; leaflets 3, lanceolate or linear-oblong, glandular, spinescent tipped, small, 2 to 3 mm. long; pedicels usually slightly longer than the fruit, deflexed, glandular; sepals lanceolate or lance-oblong, rarely more than 2 mm. long, acute; petals pale purplish, 7 mm. long; fruit 4 mm. high, minutely pubescent and glandular, with a slender beak 2 to 2.5 mm. long.

Type in the U. S. National Herbarium, No. 619,744, collected on Tiburon Island in the Gulf of California, April 11, 1911, by J. N. Rose (No. 16,779a).

This stands nearest *Fagonia insularis* but is a greener plant with broader leaflets and different pubescence and stipules.

7. **Fagonia aspera** C. Gay, Hist. Chile Bot. **1**: 470. 1845.

Type locality, Chile.

Low, rather stoutly branched plant with angled, scaberulous or puberulent branches; stipules stout, 2 to 3 mm. long, spinescent, short-villous; petioles stout, about equaling the leaflets, these obovate to oblong-lanceolate, nearly obtuse, abundantly pubescent; pedicels 2.5 to 5 mm. long, pubescent; flowers not seen; fruit 3 to 4 mm. high, conspicuously strigose with rather long hairs, noticeably tapering at the apex, with a slender beak 1.5 to 2 mm. long.

The description is drawn from poor specimens collected in Peru by the Wilkes Exploring Expedition. This is the only collection of the species seen and seems to agree well with the original description.

8. **Fagonia barclayana** (Benth.) Rydb. N. Amer. Fl. **25**[2]: 104. 1910.

Fagonia californica barclayana Benth. Bot. Voy. Sulph. 10. 1844.

Type locality, "Bay of Magdalena," Lower California.

A dichotomously branched undershrub; stem with rather slender greenish branches, 3 to 7 dm. long, finely villous-pubernlent; stipules subulate, about 5 mm. long, spinulose, reflexed-spreading; petioles 3 to 5 mm. long; leaflets 3, lanceolate, 8 to 20 mm. long, 2 to 5 mm. broad, finely pubescent, spinulose-tipped; peduncles 2 to 5 mm. long; sepals narrowly lanceolate, 3 mm. long, spinulose tipped; petals rose-purple, about 5 mm. long; blades ovate-spatulate, acutish; fruit 4 to 5 mm. long, finely pubescent, slightly reticulate; beak about 1 mm. long.

Here apparently belong the following specimens from Lower California: San José del Cabo, October 17, 1890, Brandegee 81; Lagoon Head, March, 1889, Palmer 827; Agua Verde, 1911, Rose 16,604. Remarks upon the species may be found under *Fagonia californica*. The description is that of Doctor Rydberg in the North American Flora.

9. **Fagonia californica** Benth. Bot. Voy. Sulph. 10. 1844.

Fagonia californica hindsiana Benth. loc. cit.

Type locality, "Bay of Magdalena," Lower California.

Densely branched, usually about 30 cm. high, with slender, angled stems scaberulous along the angles; petioles 4 to 9 mm. long, glabrous or scaberulous; stipules short, slender, spinescent, half as long as the petioles or shorter; leaflets 3, glabrous, narrowly lanceolate to ovate-lanceolate, acute, spinescent tipped, the lateral ones oblique, sometimes longer than the petioles and sometimes much shorter; pedicels 2 to 5 mm. long, usually much shorter than the fruit, deflexed in age; sepals lanceolate or oblong-lanceolate, acute; petals purplish, 5 to 8 mm. long; fruit puberulent, densely so when young, often nearly glabrous in age except along the angles, the beak short, about 1 mm. long.

Specimens examined:

Utah: St. George, 1879, Palmer.

Arizona: Gila City, Gila Mountains, March 1, 1894, Mearns 2820.

California: Sierra Prieta near Fort Yuma, 1855, Schott; Tia Juana, May 15, 1903, Abrams 3500; canyon west of Borrego Spring, April 19, 1906, M. E. Jones; without locality, Mexican Boundary Survey; San Bernardino, 1880, S. B. Parish; Ogelby, San Diego County, March, 1901, A. F. Eby; Cargo Muchacho, September 20, 1890, Orcutt 2076; Coyote Canyon, altitude 1350 meters, April, 1902, H. M. Hall 2794.

Lower California: Los Angeles Bay, 1887, Palmer 546; Valley of Palms, April 15, 1882, M. E. Jones 3691; Santa Rosalia, 1889, Palmer 196; San Bartolomé Bay, March 14, 1911, Rose 16,235; Lagoon Head, March, 1889, Palmer 818.

The species probably reaches the northwest corner of Sonora but I have seen no specimens from that State, unless the Schott specimen may be Sonoran rather than Californian.

The specimen from Utah differs from the others in having very small stipules and leaflets and remarkably long petioles. Probably it is a different species for it is from a region well removed from the usual range of *Fagonia californica*.

As originally published the species consisted of two forms, α *hindsiana*, and β *barclayana*. The first, of course, is to be taken as the type. The other is *F. barclayana* (Benth.) Rydb. The form *hindsiana* was described as being "glabra, stipulis brevissimis." The second form was described as "pubernla, stipulis setaceo-spinescentibus petiolo paullo brevioribus." Personally the writer is inclined to believe that these two are the same species. This opinion, however, may be altogether wrong. A few of the plants here listed under the species are nearly perfectly glabrous while others are conspicuously scaberulous. Judging from Bentham's meager descriptions alone it seems likely that these are the two forms he had before him.

10. **Fagonia chilensis** Hook. & Arn. in Hook. Bot. Misc. **3**: 165. 1833.

Type locality, "Coquimbo," Chile. Type collected by Cuming, No. 907.

Rather slender, 25 cm. high or less, with glabrous, angled branches; petioles equaling or shorter than the leaflets, glabrous; stipules stout, spreading or slightly reflexed, 3 to 4 mm. long, spinescent; leaflets obovate to linear-lanceolate, glabrous, acute or acuminate, spinescent tipped, 2 to 8 mm. long, the lateral ones oblique; pedicels 3 to 4 mm. long, reflexed in age, shorter than the fruit; sepals lanceolate or oblong-lanceolate, 3 to 4 mm. long, acute; petals rose purple, 7 or 8 mm. long; fruit about 5 mm. high, scaberulous, often nearly glabrous in age, with a beak 2 to 3 mm. long.

Specimens examined: Chile: Atacama, 1890, Morong 1180; prov. Coquimbo, R. A. Philippi.

11. **Fagonia laevis** Standley, sp. nov.

Low, densely branched perennial 20 to 40 cm. high; stems rather slender, green, glabrous, angled and striate; petioles 4 to 10 mm. long, glabrous; stipules slender, 1.5 to 2.5 mm. long, spinescent, spreading; leaflets 3, linear-lanceolate, 2 to 8 mm. long, glabrous, petiolulate, spinescent tipped, the lateral ones somewhat oblique; pedicels glabrous, shorter than the fruit, deflexed in age; sepals oblong-lanceolate, 2 to 2.5 mm. long, acute, spinescent tipped; petals rose purple, about 5 or 6 mm. long, narrow, long-clawed; ovaries and fruit glabrous, the latter 3.5 mm. high, the slender beak 1.5 to 2 mm. long.

Type in the U. S. National Herbarium, No. 855,582, collected near Yuma, Arizona, April 25, 1906, by Marcus E. Jones.

Additional specimens examined:

California: 10 miles west of Coachella, Riverside County, altitude 150 meters, April, 1905, H. M. Hall 5806.

Lower California: Tia Juana, June 30, 1884, Orcutt.

From all our other species this is distinguished by the glabrous ovaries and the completely glabrous stems. Aside from these differences it is not far removed from *Fagonia californica*.

12. **Fagonia longipes** Standley, sp. nov.

Stems very slender, glabrous, angled, about 30 cm. long, abundantly branched; petioles 4 to 10 mm. long, stout, glabrous; stipules stout, 1.5 to 2 mm. long, slightly reflexed; leaflets 3, glabrous, linear-oblong or linear-lanceolate, the lateral ones oblique, 3 to 10 mm. long, minutely spinulose tipped; pedicels 10 to 12 mm. long, slender, glabrous or obscurely scaberulous, deflexed in age; sepals lanceolate or oblong-lanceolate, acute or acuminate; petals 7 to 9 mm. long, rose purple; fruit 4 mm. high, sparingly and finely pubescent and slightly glandular, with a beak 1.5 mm. long.

Type in the U. S. National Herbarium, No. 14,222, collected in Arizona in 1876 by Dr. Edward Palmer. No other data are given on the sheet in the National Herbarium but on one in the J. H. Redfield Herbarium in the collection of the Missouri Botanical Garden, the label gives the locality as Bill Williams Fork, the date of collection as March 11, and the collector's number as 58.

The plant is related to *Fagonia californica* but may be distinguished at a glance by the very long pedicels. The stems, too, are nearly glabrous, the stipules shorter, and the whole plant more slender.

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PROCEEDINGS

OF THE

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DESCRIPTION OF A NEW MELOSPIZA FROM CALIFORNIA.

BY HARRY C. OBERHOLSER.

A series of song sparrows from eastern California, in the Biological Survey Collection, United States National Museum, appear to represent an undescribed race. Since several of these specimens were obtained by Dr. A. K. Fisher, in Owen Valley, California, during the Death Valley Expedition of 1891,* this new form may appropriately be named

Melospiza melodia fisherella subsp. nov.

Chars. subsp.—Similar to *Melospiza melodia heermanni* Baird, but larger; upper surface paler, less rufescent; streaks on lower parts less blackish (more brownish).

Type.—Adult male, No. 203,507, U. S. Nat. Mus., Biological Survey Collection; Honey Lake, near Millford, California, June 18, 1906; A. S. Bunnell.

Description of type.—Upper surface somewhat rufescent hair brown; the crown with broad lateral stripes of burnt umber, and throughout with streaks of clove brown; the back and scapulars broadly streaked with black and burnt umber; the rump and upper tail-coverts somewhat streaked with dark brown; tail sepia, edged externally with wood brown and dull russet; wing-quills grayish sepia, margined exteriorly with wood brown and dull russet; superior wing-coverts mostly burnt umber, margined more or less with pale hair brown, the median and greater series and the tertials with terminal shaft markings of black or clove brown; superciliary stripe, auriculars, and sides of neck ash gray, the first mentioned paler than the others; postocular and malar stripes burnt umber; entire lower surface, including inferior wing-coverts, dull white, the sides, flanks, and crissum washed with brownish or buffy; breast, jugulum, sides, flanks, and crissum streaked with burnt umber and clove brown.

* Recorded by Dr. Fisher (North American Fauna No. 7, 1893, p. 100) as *Melospiza fasciata heermanni.*

Measurements of type.—Wing, 66; tail 66; exposed culmen, 12.2; tarsus, 22.7 mm.

Geographical distribution.—Eastern California, south to Owen Valley; western Nevada; and central southern Oregon.

This new race differs from *Melospiza melodia fallax* Baird (= *Melospiza melodia montana* Henshaw) in its darker upper parts, more blackish brown streaks of under surface, heavier bill, and shorter wing.

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PROCEEDINGS

OF THE

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A NEW JUMPING-MOUSE FROM NEW MEXICO.

BY GERRIT S. MILLER, JR.

[By permission of the Secretary of the Smithsonian Institution.]

In 1858 a specimen of *Zapus* was collected by Dr. Anderson at Fort Burgwyn, New Mexico. It was entered in the catalogs of the U. S. National Museum on October 22 of the same year. Coues does not mention this skin in his monograph of the genus,* but Preble† refers it to *Zapus princeps* Allen. In both color and cranial characters, however, it differs widely from *Zapus princeps* and approaches the Californian *Z. alleni* Elliot. On examining the specimens of *Zapus* in the Biological Survey collection I find six representatives of the same species, collected in New Mexico since the publication of Preble's revision. As these are in better condition than the original specimen one of them has been taken as type of the long overlooked form.

Zapus luteus sp. nov.

Type.—Adult female (skin and skull) No. 133,601, U. S. National Museum (Biological Survey Collection). Collected at Espanola, New Mexico, June 24, 1904, by M. Surber. Original number, 162.

Characters.—Resembling *Zapus trinotatus alleni* (Elliot); ground color of upperparts brighter and more ochraceous (less buffy); dark dorsal area much less evident, usually, in adults, passing insensibly into color of sides, without the line of demarcation nearly always well defined in *alleni;* skull smaller and more slender but without special peculiarities of form, the antorbital foramen, as in *alleni*, relatively larger than in *princeps;* teeth without evident peculiarities, but anterior surface of incisors darker in color.

Measurements.—Type: head and body, 86; tail, 138; hind foot (dry), 31; condylobasal length of skull in type and in adult male (No. 133,604) from type locality (both with much worn teeth), 21.2 and 21.0 (22.6 and

* Monogr. N. Amer. Rodentia, pp. 461–479. 1877.

† North Amer. Fauna, No. 15, p. 23. August 8, 1899.

22.6); * basilar length, 16.6 and 16.4 (18.0 and 18.0); zygomatic breadth, 11.2 and 11.2 (12.2 and 12.6); breadth of braincase, 10.0 and 9.8 (10.8 and 10.4); depth of braincase at middle, 7.6 and 7.4 (8.0 and 7.8); nasal, 9.6 and 9.2 (9.6 and 9.2); diastema, 5.2 and 5.2 (6.0 and 6.0); mandible, 12.2 and 12.2 (13.0 and 13.0); maxillary toothrow, 3.8 and 3.8 (4.0 and 4.0); mandibular toothrow, 3.4 and 3.6 (3.8 and 3.8).

Specimens examined.—Seven, from the following localities in New Mexico: Cloudcroft, Otero County, 3; Española, Santa Fe County, 3; Fort Burgwyn, near Taos, Taos County, 1.

* Measurements in parenthesis are those of an adult female and male (both with moderately worn teeth) *Z. trinolatus alleni* from Donner, California (Nos. 100,469 and 100,244).

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